Developing ICT in a Developing Country

the implementation of a digital library system

&

improving the ICT knowledge of the local community of the Kitui District

Redmar Atsma

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Preface

It all started at the end of December 2005 that I came in contact with a Dutch organization, called Ex-change, who gives Dutch students an opportunity to do an internship in a developing country. I was looking for a graduation internship for my study Information Technology at that time and the organization could still use some ICT students for an internship in Kenya, starting in February 2006. After a short and busy period of making preparations and organizing things I was on the go to Kitui, Kenya on the 16th of February.

During my stay in Kenya, from February to June 2006, I've worked on two ICT projects, which are described in this document. This document is a complete report about my internship. Besides this document some separate documents are made for the SASOL Foundation, which is the organization I've worked for during my internship. These documents are subsets from this document in which only the, for SASOL, necessary parts are included.

My time in Kenya was one I'll never forget: good moments, frustrating moments, moments that were too hot to work, moments that it was impossible to work because the electricity had dropped again, moments I wished Internet was accessible from anyplace in the world, moments that I was thinking myself why I was trying to work on ICT here in an area with so many other troubles… but finally it was definitely worth to do the internship and therefore I would like to thank the organizations who made the internship possible: Ex-Change from Hilversum, the Netherlands and SASOL Foundation from Kitui, Kenya for which the internship is actually carried out. I would also like to thank the Noordelijke Hogeschool Leeuwarden who allowed me to undertake this, maybe somewhat uncommon, internship, my housemates who stayed with me in the student house in Kitui where we had a great time, anyone who provided me with documents for the Information Hub library, of course my family who supported me in undertaking this internship and anyone else who I forgot to mention here.

Redmar Atsma
June 2006

Summary

This report describes a graduation internship as part of the study Information Technology at the Noordelijke Hogeschool Leeuwarden, located in Leeuwarden, the Netherlands. The internship is carried out in order of the SASOL Foundation, located in Kitui, Kenya and Ex-change, located in Hilversum, the Netherlands. Ex-change is a Dutch partner organization of SASOL and gives students from the Netherlands the opportunity to do an internship in a developing country.

During the internship, as described in this report, two projects have been worked on: the Information Hub Project and the School Project. The Information Hub Project was the main project of the internship.

Information Hub Project

The main goal of the Information Hub Project is to realize some kind of digital library, accessible like a website, which can be accessed by both SASOL's employees and the local community of the Kitui district. The Information Hub Project is part of the planned Information Center, which is a long-term project of SASOL with as main objective to improve the knowledge of the community of the Kitui district by spreading and sharing information.

Setting up a pilot version of the Information Hub was the goal of this project during the internship. The pilot version, accessible from one central computer, has to be used by the local employees of SASOL for setting up an experimental version of the project and to make the employees known how to work with the Information Hub.

The pilot version of the Information Hub has been realized successfully. A digital library is set up using a specialized software system for setting up digital libraries: the Greenstone Digital Library Software. The Information Hub already contains a lot of information but will continuously grow as new information will be added on a regular base. The Information Hub is installed on a server system and is currently accessible from one client system. On a really short-term, a local network will be realized at the SASOL office, which enables all of the computers to have access to the Information Hub. In the mean time, end-users can also acquire a CD-ROM which installs a static (possibly not actual anymore) version of the Information Hub on their computer.

Besides a functioning pilot implementation of the Information Hub a lot of attention has been made on documentation. User guides and admin guides are made in which respectively the use and maintenance of the Information Hub are described. A report about the implementation of the Information Hub together with recommendations for next ICT teams has been made too.
All of the products realized during this pilot implementation project should form a stable basis for the future Information Hub.

School Project

SASOL is working on the School Project for quite a few years now. Main goal of the School Project is to improve basic computer knowledge at schools located in the Kitui district. SASOL tries to accomplish this by supplying schools with computers and educating the teachers and students at the schools.

Although the initiative of the School Project is very good, SASOL was not completely satisfied with the way the School Project was doing as it appeared that there was no continuality in the project; schools visited by SASOL for teaching had to start over and over again with learning from the beginning. The main cause of this was that there was too much pressure on teaching students and not on teaching teachers. As a result, schools were not able to give computer lessons to their students on their own and as SASOL is not and could not visit the schools very frequently, most schools were not using or hardly using their computer systems.

During the internship, two schools were visited after which a complete reorganization has been made on the School Project structure. The new structure contains much stricter rules for the schools if they want to participate in the School Project. Main rule of the new structure is that schools acquire an ICT teacher or select one of their teachers as an ICT teacher. SASOL will periodically check if the schools are working according to the new school structure's contract.

Samenvatting

Dit rapport beschrijft een afstudeerstage als onderdeel van de opleiding Informatica aan de Noordelijke Hogeschool Leeuwarden. De stage is uitgevoerd in opdracht van de SASOL Foundation, gevestigd in Kitui, Kenia en Ex-change, gevestigd in Hilversum. Ex-change is een Nederlandse partnerorganisatie van SASOL en geeft Nederlandse studenten de mogelijkheid om een stage in een ontwikkelingsland te ondernemen.

Gedurende de in dit verslag beschreven stage is aan twee projecten gewerkt: het Informatie Hub Project en het School Project. Het Informatie Hub Project was het hoofdproject van de stage.

Informatie Hub Project
Het hoofddoel van het Informatie Hub Project is het realiseren van een digitale bibliotheek, toegankelijk als een website bij zowel de medewerkers van SASOL als de locale bevolking van het Kitui district. De Informatie Hub is een onderdeel van het geplande Informatie Centrum, een project van SASOL gepland op de lange termijn en met als belangrijkste doel kennisverbetering van de lokale bevolking van het Kitui district door middel van het verspreiden van informatie.

Het opzetten van een pilot versie van de Informatie Hub was het doel van dit project gedurende deze stage. De pilot versie, toegankelijk vanaf een centrale computer, zal gebruikt worden door de werknemers van SASOL zodat een testversie van het project wordt opgezet en de werknemers bekend kunnen worden gemaakt met het gebruik van de Informatie Hub.

De pilot versie van de Informatie Hub is succesvol gerealiseerd. Een digitale bibliotheek is opgezet met behulp van specifieke software voor het opzetten van digitale bibliotheken: de Greenstone Digital Library Software. De Informatie Hub bevat momenteel al veel informatie maar zal continu blijven groeien doordat er regelmatig nieuwe informatie aan toegevoegd zal worden. De Informatie Hub is geïnstalleerd op een server systeem en is momenteel toegankelijk vanaf één client systeem. Op zeer korte termijn zal er binnen het SASOL kantoor een lokaal netwerk gerealiseerd worden, waardoor het mogelijk wordt dat alle computers in het kantoor toegang hebben tot de Informatie Hub. In de tussentijd kunnen eindgebruikers een CD-ROM bemachtigen welke een statische (mogelijk niet meer actuele) versie van de Informatie Hub op de computer installeert.

Naast een werkende pilot implementatie van de Informatie Hub is er veel aandacht besteed aan het maken van documentatie. Gebruikers- en beheershandleidingen zijn gemaakt waar respectievelijk het gebruik en het onderhoud van de Informatie Hub in staat beschreven. Ook is er een verslag over de implementatie van de Informatie Hub samen met aanbevelingen voor volgende ICT teams gemaakt.

Alle, gedurende dit project, gerealiseerde producten zullen een stabiele basis moeten geven voor de toekomst van de Informatie Hub.

School Project
SASOL werkt nu sinds een paar jaar aan het School Project. Het belangrijkste doel van het School Project is het verbeteren van de basis computer-vaardigheden op de scholen in het Kitui district. SASOL levert de scholen hiervoor computers en geeft docenten en studenten van de school les in de basisvaardigheden van het computer gebruik.
Hoewel het idee van het School Project erg goed is, was SASOL tot nu toe nog niet helemaal tevreden over het School Project aangezien er weinig continuïteit in het project zat; scholen die werden bezocht door SASOL moesten keer op keer opnieuw bij het begin beginnen voor wat betreft lesgeven. De voornaamste oorzak hiervan was dat er teveel aandacht werd besteed aan het lesgeven van studenten in plaats van aan de leraren. Het gevolg hiervan was dat de scholen niet in staat waren om zelfstandig computerles te geven aan de studenten. Omdat SASOL niet instaat is om alle scholen frequent te zoeken werden de computersystemen op de meeste scholen niet of nauwelijks gebruikt.

Gedurende deze stage zijn twee scholen bezocht. Aan de hand van dit bezoek is een complete aanpassing gemaakt aan de structuur van het School Project. De nieuwe structuur bevat strengere regels waar de scholen zich aan moeten houden willen ze deelnemen aan het School Project. De belangrijkste regel van deze nieuwe structuur is dat de scholen een ICT leraar aanstellen of één van de huidige leraren van de school aanstellen als ICT leraar. SASOL zal periodiek controleren of te scholen zich houden aan de nieuwe structuur, zoals omschreven in het ‘school structure contract’.

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1. Introduction

During this internship, two projects have been worked on: the School Project and the Information Hub Project.
During the first weeks, two schools have been visited as part of the School Project. The school project, although started at first, is described after the Information Hub Project as the Information Hub Project was the main project of the internship.

Before describing the projects, the involved organizations are described first in Chapter 2. Chapter 3 then describes the implementation of the Information Hub, together with recommendations for future ICT teams on how to improve and/or extend the Information Hub. Chapter 4 describes the School Project; a small report with a description about the current situation of two visited schools can be found here and also recommendations for next ICT teams are given.
Chapter 5 gives some general recommendations on the field of ICT to SASOL, chapter 6 does the same but then for Ex-change. After that, the report concludes with a personal conclusion found in chapter 7.
The report is also accompanied with a large set of appendices. The contents of the appendices can be found under chapter 9.

2. Involved Organizations

Three organizations are involved in this internship:

- SASOL Foundation
- Ex-change
- Noordelijke Hogeschool Leeuwarden

2.1. SASOL Foundation

The SASOL Foundation, located in Kitui town, Kenya, and active in the entire Kitui district, has been founded in 1992. SASOL stands for Sahelian Solutions and operates in arid and semi-arid areas (Sahelian is an Arabic word for arid and semi-arid). SASOL is an NGO (Non Government Organization) and was initially involved in the process of food distribution during the food shortage in Kenya and Somalia back in 1992.
Quickly, SASOL moved to water management; the creation of sand dams and water points was the basic mission of SASOL during that time and this is still the core task SASOL is dealing with nowadays. But, during the last few years, SASOL broadens the field it is working on; improvements on the field of energy, ICT and agriculture do now belong to SASOL's mission plan as well.

The goal of SASOL is to assist in the development of the arid and semi-arid areas. The philosophy of SASOL in this is that the local community has to develop the area by themselves. Therefore, education and the exchange of information are part of SASOLs' philosophy. At the moment, it happens too often

that developing organizations uses their own knowledge to solve specific problems in a developing country. This manner is sufficient enough to solve the problem but not to keep the situation up as the knowledge is gone at the time the organization has finished work. SASOL tries to establish a long-term solution by educating the local community as a proper education is one of the foundations for the development of a country.

2.2. Ex-change

Ex-change, located in Hilversum, the Netherlands, is a partner organization of SASOL. The philosophy of Ex-change is, just like that of SASOL, to educate the community of a developing country. Ex-change tries to accomplish this by sharing the knowledge of Dutch students with the knowledge of students from a developing country (the ex-change of knowledge).

Ex-change gives Dutch students the opportunity to take their internship in a developing country. The actual internship takes place at one of Ex-change's partner organizations, like SASOL is in Kenya. Other partner organizations are located in Ghana and Malawi.
Ex-change supports their partner organizations by coordinating the projects from the Netherlands and supporting them financially with money acquired from sponsorships and gifts.

2.3. Noordelijke Hogeschool Leeuwarden

The Noordelijke Hogeschool Leeuwarden is a University for professional education located in Leeuwarden, the Netherlands. The internship described in this report is carried out for the division of Information Technology.
Information Technology is far from developed in a country like Kenya and therefore an internship in such a country will completely differ with an internship in the Netherlands. But, as the University always encourages their students to gain international experience during their study and a lot of other factors play a factor during an internship like this, the University supports the idea of the internship.

3. Information Hub (Project 1)

The Information Hub will be part of the future Information Center of SASOL. A short description about the Information Center will be given first.

3.1. Information Center

SASOL has plans to setup an Information Center in which both the employees of SASOL and the local community can gather and share information. The availability of reliable information is very import for a country in development as knowledge is the foundation for development. People like farmers, health employees, constructors of water dams etc. should have access to the

Information Center to acquire the knowledge they need to know to perform or improve their work.

The Information Center is planned to be realized within the coming 5 years. Because this project is planned for the long-term the exact detail are still a little bit vague. Though, some parts which are needed for the future Information Center are already known and the implementation of these can be started right now.

3.2. Information Hub

The Information Hub will be one of the major parts which will be needed for the Information Center. The Information Hub has to be the ICT infrastructure of the Information Center.
Spreading information is the main goal of the Information Center and ICT is an indispensable means for this. Therefore, a reliable ICT infrastructure is an important factor that has to be implemented.

3.2.1. Pilot Version

The Information Hub will be implemented far before the Information Center is a fact. The plan is to first start with what is called a *pilot version* of the Information Hub. The pilot version of the Information Hub is intended only for the employees working at SASOL to support them in their work by providing them with important documents with useful information. Actually, the pilot version is just a digital library of informational documents.

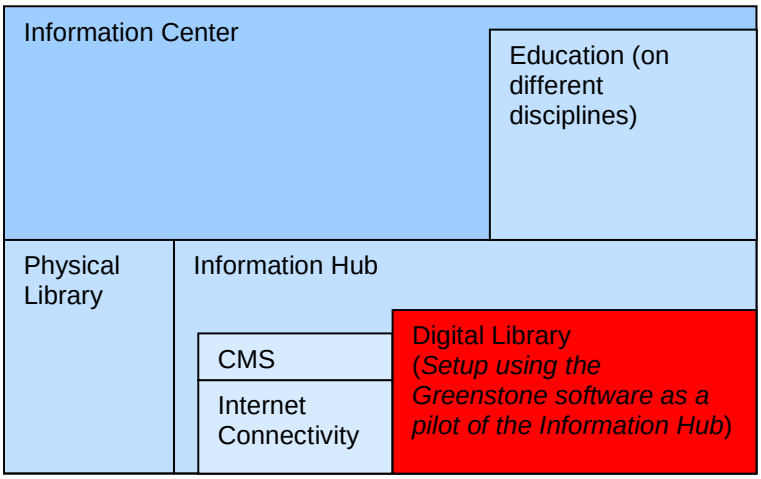

Figure 1. Information Center overview

Figure 1 gives a very rough overview of what the Information Center should look like in a few years. As can be seen in the figure, the Information Center will be formed by several different components. Most of these components are only planned very globally, but the part indicated in red is already considered and prepared in a more detailed way, and that is what the project described in this

document goes about: setting up a Digital Library as part of the future Information Center.

It has to be mentioned that the term Information Hub and Digital Library are currently used as one and the same. When looking at the Information Center overview in the figure above one can see that these terms are actually two different concepts. But, within the SASOL office, the term Information Hub is more commonly used than the term Digital Library. This, together with the fact that the Digital Library will be the only component for the *pilot* version of the Information Hub and that it will be the core component of the Information Hub hereafter, makes that both terms for the pilot version will be used for what represents the red component in the figure above: the Digital Library.

3.3. Requirements for the Information Hub

A complete research[1] about the requirements of the Information Hub is already done by a previous student. The research exposed that the following requirements for the Information Hub are needed:

1. Digital library
2. Search function, also by means of categorization
3. Reference to hard copy sources
4. Multi-user system
5. Internet connection
6. Discussion Forum
7. Authorization
8. Printing function

The next sections summarize these requirements. The complete analysis made before the start of the project can be found in APPENDIX A – Information Hub Analysis**.**

Digital Library
The Digital Library is the major component of the Information Hub. Digital documents, in the form of Word or PDF documents, have to be accessible from a centralized location. The documents which are placed in the Digital Library should support the employees of SASOL in their work and can be like:

- Old students reports
- General reports
- Planning schemes
- Work plans
- Relevant articles
- Digital books
- Course material

[1] De Informatie Hub, Meryem Touzani, 12 jan 2006

- Project documentation

Search function
The Digital Library should be searchable, both by searching on keywords and by browsing trough categories. Searching trough the categories allows the end-user to lookup multiple documents about a specific category. Categories can be like:

- Agriculture
- Energy
- Hydrology
- ICT
- Lab Technology
- Pump Technology

Categories can always be added and removed from the Digital Library, depending on the documents supplied. Categories can also contain subcategories to further specify a category.

Reference to hard copy sources
Hard copy documents will be part of the Information Center and should be referenced from the Information Hub. A summary about the content of a hard copy document should be placed on the Information Hub, together with the physical location in the Information Center where the document can be found.

Multi-user system
The Information Hub should be accessible by multiple users at the same time and should be setup according a client-server structure, so that it can be accessed over an internal network or the Internet.

Internet connection
The Information Hub should be connected to the Internet. At first, it is not realistic to use the Internet connection for making the Information Hub accessible from the Internet, as local hosting at the SASOL office is impossible with the low budget and the primitive ICT environment.
The Internet connection should purely be used for looking up information and for improving the connectivity and consequently the communication with the Netherlands.

Discussion forum
A discussion forum should be setup to let the different teams from the Netherlands communicate with each other during the preparation phase of their internship. The weight of this point seems to be of less importance at the moment as Ex-change, the Dutch partner organization of SASOL, recently setup an own discussion forum which can be accessed from the Internet.

Authorization

One or more system administrator(s) has to be assigned for maintaining the Information Hub. Only an administrator should be able to add new information to the Information Hub to preserve consistency.

Printing function
There should be a possibility to print the information that can be found on the Information Hub. This point is a little bit problematic as printing is very expensive for an NGO working with a small budget.

3.4. Type of Documents

Most of the documents that will be placed in the Digital Library of the Information Hub are PDF documents. Documents supplied in the Microsoft Word format will be converted to PDF format before they are placed in the Digital Library as the PDF format is more user-friendly to read.
Besides PDF documents, other documents can be found in the Digital Library. Images, Excel spreadsheets, but also executables for different tools, like Adobe Acrobat, Excel viewers, etc., will be placed in the Digital Library.

3.5. Standard Software or Custom-Made Software

A decision had to be made if either standard software or custom-made software is the best solution to be used for the Information Hub. When setting up a similar system in a developed country, instead of in a developing country like Kenya, the choice would most likely be to use custom-made software. Custom-made software can be developed exactly the way the customer wants and can therefore fulfill the specific requirements, no more and no less. Besides this, setting up a digital library system for the Information Hub would not be a very complex project and hence it can be done with a relative small budget and within a limited amount of time.
But, the circumstances in a developing country are completely different than they are in a developed country. There is no ICT infrastructure at all, or at least it is very limited, what makes software development hardly impossible. The lack of the right tools but mainly the lack of an Internet connection is the major factor in this.
It is right that one can say to develop custom-made software for the Information Hub back in the Netherlands and to ship the software to Kenya as soon as it is finished. If the budget is available and the communication between SASOL and the Netherlands is fine this can certainly be a solution. Unfortunately, as SASOL is an NGO, the budget is very small and the communication between SASOL and the Netherlands is problematic as well. Developing a digital library system can be done as an internship project from the Netherlands by a student to keep the costs low, but finally the system has to be implemented at the SASOL office in Kitui, Kenya. It is not unlikely that, after implementing the system, changes have to be made to the system because bugs arise, the requirements of the end-users are not fully implemented or end-users get new ideas to be implemented. These factors, in combination with the limited communication means and primitive

situation to deal with, can make the creation of the system a sloping and endless process.

When choosing standard software the development of the system is more or less the responsibility of a team of software developers who can focus entirely on the development of a stable software program. The implementation and customization of the already available software can be done locally at the SASOL office which should not be too problematic if the minimum requirements, like proper hardware, are available and the software is shipped with thorough documentation.

The drawback of using standard software is that it is normally written for general purposes; it has to be used for as much goals as possible which makes the usability of the software sometimes more complex than necessary because the software contains a lot of features and ways for customizing the software, much more in fact than is needed for one specific goal. Due to the fact that a digital library is not a very complicated system this should not be a very big issue; a digital library is just a collection of digital documents and there are not many different ways to represent these. After that, customizing the digital library is for an NGO like SASOL not the point with the highest priority. In fact this point has a very low priority. The most important point of the system is to supply end-users with the right information.
Compared to custom made software, maintaining the system may be a little bit more difficult when using standard software, as the software is built for general use and a lot of extra functionality (and complexity) may be available for the maintainer. But this can be compensated by making thorough documentation for the system specific to the organization and specific to the way it should be used inside the organization.

Another factor to consider is the durability of the software to be used. Custom-made software, when developed with a low budget (e.g. during an internship project), can be very difficult to maintain (as seen from the software engineering viewpoint). For example, suppose that the system is running for a few months and then an important bug shows up in the software, which is developed during an internship project. The developer is most likely not being able to fix the bug anymore as the internship is already over. When fortunate there is a subsequent student on an ICT internship that can look at the problem, but even then it is likely that serious bugs cannot be fixed or necessary extensions cannot be made to the software. When working with standard software, a team of software developers can take care of bug fixes and extensions which ensures the continuality of the software and at the same time that of the Information Hub.

These points, together with the research about the Information Hub showed Greenstone to be the best solution for the Information Hub.

3.6. Greenstone Digital Library Software

The Greenstone Digital Library Software (GDLS) is an Open Source web based software application for distributing digital documents. The software is developed and maintained by the New Zealand Digital Library Project at the University of Waikato, in relationship with the UNESCO and several NGO's (Non Government Organization). Therefore, the software is commonly used within development organizations.

Greenstone runs on both the Windows and Unix/Linux operating system and is distributed according the GNU General Public License.

GNU General Public License (GPL)
GPL is an open source software license which claims that and end-user of the software is free to look into and modify or use the source code of the software program. It is allowed to redistribute the software and even to make profit on it without the permission of the original distributor. A prerequisite is that the software constantly stays on the GPL license.

Open source software can be very powerful as a lot of people from all over the world can work on one and the same project. Not being dependent on one software developer gives a lot of flexibility; bugs can be solved quickly and software applications can completely be customized.

The Greenstone software will work on most common webservers. However some modifications to the configuration of the webserver have to be done. The Windows distribution of the Greenstone software comes with an own built-in webserver and, if setting up a server solely for Greenstone, this is the recommended webserver to use as no extra configuration at all is necessary.

Initially, clients who want to access a digital library built with the Greenstone software are not required to run extra software on their computers as the library is accessible like a web page. However, as the documents stored in the digital library are provided to the end-user in a form different than HTML, like in PDF or Word format, external applications or plugins are needed on the client side to view these documents.

Greenstone Macro Language
Greenstone makes use of an own language for generating the user interface: the Greenstone Macro Language. The Macro Language is an abstraction above HTML and eases modifying the user interface. More and also the technical details about the Macro Language and the other parts of the Greenstone software can found in APPENDIX C – Information Hub Admin Guide (advanced, with technical documentation).

3.7. Problems and Limitations

Problems in realizing the Information Hub will mainly be caused by the limited ICT infrastructure, but also the small budget and limited hardware available for the Information Hub plays a factor. The lack of a reliable Internet connection slows down the realization of the project dramatically as it limits the information feed, which is a must for software engineering nowadays due to the complexity of the profession. But also for downloading specific software components, required for the Information Hub, is a reliable Internet connection indispensable.

Looking up information is possible on a very limited scale; the only Internet connection available in the neighborhood of the SASOL office is at the post office in town. Unfortunately, the Internet speed is very slow, which makes it difficult to find the proper information.
Downloading software is completely impossible as the post office does not allow their customers to use floppy disks or USB sticks to be connected to the Internet computers. The most nearby place for downloading software is Nairobi.

3.8. Information Hub Infrastructure

Currently, a server and a client system are being used for the Information Hub. The benefit of the Information Hub will show up only when all of the computers inside the SASOL office have access to the Information Hub server. Unfortunately, at the time of writing, no network devices are available. Network devices are expensive to buy in Kenya and are only sold in Nairobi. Due to the high price and the limited availability of these devices, buying them (second) hand in the Netherlands would maybe be a better solution. Chapter 3.13.12, Second Hand Hardware, discusses this subject in more detail.

As a temporarily solution, the Information Hub will be placed on a CD-ROM and spread trough the SASOL office. A drawback now is that the contents are static; no new information can be placed on the Information Hub CD-ROM version without making new CD-ROM copies. But, working this way, the Information Hub is at least more accessible than working with only one single client system. Still, the most up-to-date version of the Information Hub is always accessible from the single client system at the SASOL office.

3.8.1. Information Hub Server

The system used as Information Hub server is a Pentium III 866MHz with 128MB of memory and a hard drive capacity of 20GB. The system is a little bit low-end compared to the functionality it is used for, especially when looking at the hard drive capacity as a lot of documents will be stored in the library and the used disk space will increase very quickly. For the initial pilot version however, the systems can be used without too much problems as the pilot version will be used only on a small scale. As soon as the pilot version is a success plans can be made for the purchase of a new, more powerful system.

The Information Hub server is located in the ICT room of the SASOL office as this is the place with the most power supplies. The ICT room is also centrally placed inside the office which makes it a suitable place in the office when client systems, located elsewhere in the office, have to be connected to the server system.

Server system specifications:

Processor	P3 866MHz
Memory	128MB
OS	WinXP
Hard drive	20GB
IP-address	192.168.0.1
Workgroup	SASOL
Computer name	Lion

3.8.2. Information Hub Clients

Clients can be added to the Information Hub without too much effort; the Information Hub software (Greenstone) can be accessed like a web page and therefore the only requirement for the client systems is that they are equipped with a network interface card and up-to-date browsing software.

One client system is placed at the ICT room to prevent that the Information Hub server is used for both server and client. It is important to keep the server as a server system only to minimize the chances of troubles with this system.

Client system specifications:

Processor	Celeron 633MHz
Memory	128MB
OS	WinXP
Hard drive	10GB
IP-address	192.168.0.2
Workgroup	SASOL
Computer name	Client1

3.9. Organization of the Information Hub Web Interface

The organization of the Information Hub web interface is plain and simple. The interface consists of five main components:

- Home Page
- Search Page
- Category Page
- Title Page
- Software Page

3.9.1. Home Page

The Home Page is the page the end-user enters on when opening the Information Hub on the client-side. The Home Page gives a short description about the Information Hub and contains a search module in which simple searches can be made. More advanced searches can be made on the Search Page.

3.9.2. Search Page

The search page allows the end-user to make more advanced searches. The end-user can choose what to search for, e.g. text from the contents of the documents or for titles of the documents. Also options like to search for all of the keywords entered (AND) or to search for some of them (OR) can be specified here.

3.9.3. Category Page

The Category Page allows the end-user to browse trough the different categories of the Digital Library.

3.9.4. Title Page

The Title Page displays all of the documents from the digital library, ordered alphabetically and in a structured way (documents are filtered per character).

3.9.5. Software Page

The Software Page contains useful software applications and tools, like Adobe Acrobat that are available for download.

3.10. Look Back Upon the Information Hub Project

When looking back at the realization of the Information Hub, a lot of work has been done, now and then with some frustrations but the final result is at least positive.

It all began with acquiring the right software to be used for the Information Hub. The Greenstone research report recommended to use the Greenstone software for the Information Hub, as this software meets the requirements of SASOL. The Greenstone software can be downloaded from the Internet but, as downloading the software in Kitui town is impossible, the software had to be downloaded from Nairobi (where SASOL has a contact person on ICT), placed on CD-ROM and sent to Kitui town. At first, this seemed to be the fastest solution, but after all it took almost two weeks before the software arrived. First, there was a problem with downloading the software, so an alternative software application (Fedora) was downloaded and sent. Unfortunately, the software didn't work at all because the files on the CD-ROM were corrupted. Besides this, it was more logical to use the Greenstone software as a complete research had been done about the Information Hub and this software appeared to be the most appropriate one to be used.

Fortunately, after a few days and some phone calls with the contact person in Nairobi, the Greenstone software was downloaded successfully. Now the only step left was sending the CD-ROM from Nairobi to Kitui town. This looks like an easy task but this is where the African culture plays his part. The first CD-ROM, with the Fedora software, was taken by a SASOL employee who was traveling from Nairobi to Kitui town. The second CD-ROM, with Greenstone, had to be sent by post, but the ICT contact person was very busy at that time and every day he forgot to send the CD-ROM. Almost everyday phone calls with the contact person in Nairobi were made to ask if the CD-ROM already had been sent and everyday it was said that the CD-ROM will be send out tonight and should arrive the next day. But, as Africans are normally not very strict on appointments, the next day no CD-ROM had arrived. This situation lasted for more than a week and in the mean time some side work has been done: installing computers for the School Project, repairing computers at the office, and making some reports about the School Project. Finally, during a call with the ICT contact person it was said that the CD-ROM was sent per courier and that it would arrive the next day. This time it was for true, because the next day the CD-ROM arrived!
It took really a long time before the software finally arrived. A learning point from this is that it is better to not rely too much on other people here; traveling to Nairobi by and acquiring the software from there yourself would be much faster.

Now that the right software finally arrived the process of learning the Greenstone software started. It took around one week to thoroughly understand the basics of the Greenstone software. Reading the documentation and experimenting with the software was the major task during this week.

Hereafter a first concept of what will form the pilot version of the Information Hub was created; just a plain simple website interface that gives the possibility to browse through the Digital Library.
A small uneasiness about the creation of the hierarchical category structure for the Digital Library was found what later appeared to be an outdated problem and caused some unnecessary work.
The reason that it at first was not clear that the problem was outdated was caused by the fact that the most recent documentation, shipped with the Greenstone software, was still describing a previous version of the software. In the earlier versions of Greenstone, the way categories were created was by using a text file. Figure 2 shows a part of what such a text file could look like. Every line in this text file represents a (sub)category. The first string of a line corresponds to the identifier of the (sub)category. The subsequent number is the position of the (sub)category in the hierarchical category structure and the last string is the display name of the (sub)category. When a file was added to the library, a metatag (described in the Admin Guides) could then be used to refer to a specific identifier; the file was then being added at the accompanying position in the category structure.

```
"Water & Water Management" 1 "Water & Water Management"
"Hydrology" 2 "Hydrology"
"Agriculture" 3 "Agriculture"
"Healthcare" 4 "Healthcare"
"Energy" 5 "Energy"
"ICT" 6 "ICT"
"ICT_TEAM44ICT" 6.1 "Team 44 ICT"
```

Figure 2 - content of categories.txt

Editing text files is not a user-friendly task and therefore the decision was made to create a small Java application that forms a graphical user interface for editing this text file.
The small application was in the middle of development when it became clear, by accident, that the new version of the Greenstone software had an alternative (also in a graphical way) for creating the categories. Therefore, the just created Java application was now useless. Fortunately, it was just a small application so it didn't grab too much time of the project.

After this, the work could continue on setting up a basic version of the Information Hub. At the same time the default layout of the Greenstone software was completely modified; a new SASOL logo has been created, new buttons were made, the organization of the web interface layout has been changed and some minor changes to the functionality have been made.

When the basic pilot version was realized, the first user guides and some checklists that describe how to maintain the Information Hub and how to add new files were made. Using these guides, SASOL's ICT employee had been taught about the Information Hub. The teaching process was mostly just a 'learn by doing' process; most of the time, when new files were added to the Information Hub, the ICT worker at SASOL did it by herself using the guides so that she became known how to work with the Information Hub.

The final phase of setting up the pilot version of the Information Hub consisted of working on the smaller points for improving the Information Hub and continuing with writing guides and other documentation. It has also been tried to realize a local network at the SASOL office so that all of the computer systems could have access to the Information Hub. Unfortunately, this point did not succeed. It appeared that the cost of newly bought network devices is very high, even higher than in the Netherlands. Therefore, it would maybe be a better idea to buy second hand devices from the Netherlands and let them ship to Kitui.

As a temporarily solution, to give multiple systems at the SASOL office access to the Information Hub, multiple CD-ROMs has been created, at which a copy of the Information Hub is found. This way, the Information Hub can be spread trough the office.
Copying a collection on CD-ROM can be done using a functionality of the Greenstone software. But, this functionality is not part of the default Greenstone

software; it has to be downloaded from the Internet as a separate module. So, there was the problem again of getting the software to Kitui. This time no waiting on a CD-ROM send by post anymore but a visit to Nairobi instead to download the software. The required download was about 20MB in size and normally this can be downloaded in a relative short period of time in Nairobi. But, just that day of the visit to Nairobi, the Internet was very slow; download speeds of around 2kB/sec caused the download to last for a few hours. So, as a consequence an extra night in Nairobi has to be made, but at least the software came to Kitui relative quickly and the CD-ROMs could be made and spread trough the SASOL office!

3.11. Evaluation of the Planned Requirements

When comparing the situation of the Information Hub Project with the planned requirements (see APPENDIX A – Information Hub Analysis) for the Information Hub the following can be said:

The major part of the Information Hub Project, setting up a digital library, has been reached. The digital library component is now in such a state that it can be fully used internally at the SASOL office. A lot of documents are already added to the Digital Library in a structured way; however, more digital documents will be added continuously. Extension of the system with multiple clients is possible and easily; the digital library is accessible as a website and so client systems only have to be connected to the Information Hub server.

Using the Information Hub for storing references to hard-copy sources was also one of the requirements of the Information Hub. This point has not yet been realized, just due to the simple fact that there are hardly any hard-copy sources available at the SASOL office. Further, the Greenstone software is not the ideal software to be used for a system like this. There are more specialized software applications available, the ones that are also being used in real libraries, which can be used for such a system. Software like this can be used in the future, besides the Greenstone software.

Other requirements which are not yet reached are an Internet connection and printing functionality. A reliable Internet connection is not yet available in Kitui town and will most likely not become available in the near future. Currently, there is a dial-up connection available at the SASOL office, but this one can only be used for e-mail. An ICT student of the next ICT team has planned to do a small research on alternative dial-up providers available in Kitui town, so that an Internet connection can be used for looking up information and that it is at least possible to download some small files from the Internet sporadically.
Printing functionality appeared unrealistic for the Information Hub. There are some old printers available but the ink is very difficult to acquire. One laser printer is available at the secretariat of the SASOL office, but this one is not really intended for frequent use as it is too expensive.

The implementation of a discussion forum had a low priority and it was already unlikely to implement a discussion forum for the pilot version of the Information Hub. Though, in the future a discussion forum, or some kind of messaging system, can be implemented as part of the Information Hub. Chapter 3.13.2, Digital Communication System, gives more details about how this could possibly be implemented.

At the start of the project some documentation that has to be made was planned as well. Most of the time was spend on the creation of the user and administration documentation and the Information Hub final report, which is a subset of this report. During the realization of the project it became clear that a lot of attention has to be spent on the creation of proper documentation, not only for maintaining the Information Hub but also for the end-users who will use the Information Hub in the future. The final report will contain a lot of information about the current situation of the Information Hub, together with recommendations about what has to be done and what can be improved on the Information Hub. An evaluation report is now integrated with this final report because both reports are more or less related.

A document about the backup possibilities was also planned, but it appeared quickly that the purchase of proper backup facilities will be difficult, mainly because of the high costs but also because the availability of proper backup devices, like tape drives, are difficult to acquire.
The plan for now is to temporarily backup the contents of the Information Hub to a computer connected to the server system over the network. A checklist, which describes the backup procedures, has been made for this and can be found in the advanced Admin Guide. The best way, to improve the backup facility in the future is to buy the devices in the Netherlands, maybe second hand, and ship them to Kenya. Chapter 3.13.12, Second Hand Hardware describes this solution in more detail.

3.12. Evaluation of the Greenstone Software

Documentation
The Greenstone software is shipped with some basic documentation. These documents are most useful: the ‘Greenstone Digital Library Developer’s Guide’, ‘Greenstone Digital Library User’s Guide’ and the ‘Greenstone Digital Library Inside Greenstone Collections Guide’. The documents can be useful to start with when learning the basic parts of Greenstone. A drawback of the documentation is that it stays at the basics more or less. The developers guide contains a more advanced part about the Greenstone Runtime Environment, which can be useful for modifying the source code.
What is missing in the documentation is some kind of API (Application Programming Interface) description which describes Greenstone’s Macro Language in more detail.

Also, a lot of documentation is not up-to-date anymore as the software version of the Greenstone software is newer than the version described in the documentation. Normally, this shouldn't be a very big problem as most of the functionality stays the same, but on some points, as experienced during this project, things are changed in such a way that up-to-date documentation is indispensable.

Layout modification
The Greenstone macro language is used for modifying the layout of a Greenstone Library. In the beginning it takes some time to understand the functionality of the macro language, but reading the accompanied documentation together with examining the existing macro files is a good way to become familiar with it. Despite the fact that the macro language makes it very easy to modify the major part of the layout it can be a little bit tough to work with now and then, especially when some of the less general layout parts have to be modified. The macros, created using the macro language, are spread trough several files and because every macro represents a specific part of the layout it can be difficult sometimes to find where such a specific layout part can be found. Especially about the less commonly used macros, but even about general macros, no or less documentation can be found. This is a real drawback when fully customizing a collection's interface.

General maintenance
The general maintenance (like adding/removing files, changing descriptions etc.) of a Greenstone collection is done using an application called the 'Greenstone Librarian Interface'. Behind the scenes, the complete Greenstone collection is generated using a large amount of Perl scripts. The Librarian Interface eliminates these scripts to the maintainer which makes maintaining a Greenstone collection much easier and less error-prone.

Conclusion
Generally said, the Greenstone software is a powerful piece of software for maintaining large amounts of information. For an end-user it is, thanks to the powerful way of indexing document keywords and the categorization function, easy to find information. Extension of a library set up using the Greenstone software shouldn't be an issue; a small library of a few hundred megabytes can easily grow out to a very large library containing gigabytes of information, provided that a consequent way of maintenance is being used.
The consequent maintenance is maybe one of the weaker points of the Greenstone software. Of course, working with large digital libraries always requires a very consequent way of working but in Greenstone it could have been easier on some points. E.g. the way categories are assigned to imported files makes it sometimes a little bit difficult for the maintainer to oversee to which category a file belongs because, behind the scenes (in the Librarian Interface, it is not possible to lookup the files belonging to a specific category. The maintainer has to maintain the imported files in a separate folder structure, for which it is the

best to let this folder structure match with the actual category structure of the library, so that a file in a specific category (as seen from the end-user's point of view) is easier to find back behind the scenes (as seen from the maintainer's point of view).
That the imported files are completely separated from the actual library contents is also a drawback oneself: the files are stored on the server twice and it requires the consequent work approach as described above. After all, when taking the consequent way of working in mind, maintenance of the information is relatively easy.

The pros and cons of the Greenstone software summarized:

Positive

- Powerful search indexes
- Scalable
- Macro language eases layout management
- Relative ease of maintenance (when working consistent)

Negative

- High amount of consistency is required
- Import directory is separated from actual library. As a result files are stored twice and an extra consequent way of maintenance is required
- Specific macros are not always easy to find, mainly caused due to the limited documentation found about the macro language.
- Documentation is too global

3.13. Recommendations to Next ICT Teams

The pilot version of the Information Hub is a fact; the system is up and running and can be used as a digital library.
Though, as the Information Hub Project is part of a long-term plan and especially because the project is still in a pilot phase, a lot of work can be done to improve the system.

3.13.1. Maintaining Consistency

First of all it is very important that a lot of maintenance will be done on the Information Hub. Maintaining large amounts of information is not an easy task; it is very easy to mess things up when not maintained correctly. It would be a good practice to browse once or twice a week trough some random categories of the digital library to check that the documents are placed under the right category, the right titles and descriptions are given etc. Also, for the end-users it should be made clear that they mention inconsistencies of the digital library immediately to the ICT staff. An internal digital communication system would be very useful to support in this.

3.13.2. Digital Communication System

It would be good to equip the Information Hub with a digital communication system. This can be in the form of a digital forum at which the SASOL employees can leave messages, but at least it is important that the employees can address the ICT staff so that they can immediately make note of any inconsistency, a request for the placement of a document, or anything else an end-user would like to mention the ICT staff of. Some kind of internal mailing system should be realized for this.

3.13.3. Obtain Greenstone Source Code

To fully customize the Greenstone software, it is necessary that the source code of the Greenstone Runtime System becomes available at the SASOL office. Most of the customization of the layout can be done outside of the source code but especially for customizing the functionality of the software, the source code is needed.

The source code of the Librarian Interface has to be obtained as well. The digital library is maintained using the Librarian Interface and can be completely customized to the conventions used for the Information Hub by making very simple modifications to the source code. E.g. as a convention, assigning a category metadata to a document has to be done completely in uppercase. This has to do with the sorting mechanism of the categories as sorting happens case sensitive. Currently, the administrator has to take care that the category is filled uppercase but this can be solved by modifying the source code in a way that all of the entered characters are converted to uppercase automatically.
The source code of the Greenstone Runtime System is written in the C++ language (using the Standard Template Library), so a C++ compiler, or even a complete IDE for developing C++ applications is necessary as well.

The source code for the Librarian Interface is written in the Java language, so Java development tools are needed as well.

3.13.4. Evaluating, Improving and Extending

Evaluation of the Information Hub is very important to make the project a success. At the moment the Information Hub is still in a very early stadium and as soon as the system will be launched for official use at the SASOL office, a lot of evaluation on the functionality of the Information Hub has to be done. Weak points of the Information Hub will become clear as soon as the end-users start working with the system and also new ideas or changes for the Information Hub will be made by the end-users. Therefore, it is important to carefully listen to the wishes and complains of the end-users. Problematic points should be evaluated and solved as soon as possible.
After the Information Hub is in use for two months, an evaluation report should be made in which the feedback of the end-users together with the problematic points and general points for improvement are reported. Hereafter, evaluation reports should be made on a regular base.

Based on the evaluation reports, the Information Hub should be improved and extended.

Take in mind that the Greenstone software, although very powerful, is specialized software. The Greenstone software is intended for creating digital libraries and even though it can be used for other goals it is not practical to do so as it gives less flexibility. When extending the Information Hub further than the Digital Library component, a choice had to be made if this can be done by using the Greenstone software or that alternative software, or maybe even custom-made software, has to be used.

3.13.5. New Server System

The system currently used as the Information Hub server is in fact not powerful enough to act as a server, especially the hard drive capacity is a big concern. The system is sufficient as long as the Information Hub is still a pilot, but a new powerful system is really necessary in the near future. Unfortunately, a new system doesn't fit in the budget of SASOL most likely, so a new hard-drive with a large capacity will be satisfactory at least.

3.13.6. Internet Connectivity

A connection to the Internet would be very useful for the Information Hub. At the time of writing only dial-up connections are available in Kitui town and it is not very likely that high speed Internet will become available in the near future.

As soon as high speed Internet becomes available research has to be done about making the Information Hub accessible from the Internet. Most likely, it is way too expensive and also not possible due to the limited ICT infrastructure to host the ICT hub locally at the SASOL office. It would therefore be more likely to use an external hosting provider for this.

3.13.7. Extension / Improvement of Documentation and Guides

Proper and up-top-date information is important. The current documentation should therefore be improved on the points that are not completely clear yet. When changes are made to the Information Hub, the documentation has to be renewed immediately.

3.13.8. Education of the ICT Employees

It is also important that SASOL's ICT employees know how to maintain the Information Hub. The advanced maintenance, as described in the advanced admin guide (Advanced maintenance of the Information Hub), is not necessary to be done by the local employees, as the advanced maintenance is not very frequent and can be done completely by ICT students from the Netherlands. Though, maintaining the consistency and adding and removing information, as described in the basic admin guide (Basic maintenance of the Information Hub) has to be done by SASOL's ICT employees completely in the future. Therefore,

next ICT teams should pay a lot of attention on the training of SASOL's ICT employees. This can be done by extensively making use of documentation but also by giving practical training courses.

3.13.9. Network

The Information Hub will be much more useful when all of the computers inside the SASOL office do have access to it. A small local network has to be setup for this. As network devices are expensive and not easily available in Kenya, buying them, possibly second hand (see 3.13.12, Second Hand Hardware) from the Netherlands would be a better solution). Taking some tools, used for creating a network, like cables, RJ-45 connectors, RJ-45 crimping tool for attaching the connectors to the cables, etc. is also useful. Most of the systems at the SASOL office are already equipped with a network interface card and some extra cards can be found at the office. So the need of taking these is not necessary.
APPENDIX E – Network Cost Overview gives a rough overview of the expected cost when buying the network devices in Nairobi.

Wireless Network
Besides setting up a network using wires, the realization of a wireless network should definitely be considered. Costs are still higher than using a wired network but buying the needed devices second hand could be reasonable.
The availability of a wireless network would really be convenient as it will not be an easy task to lay cables throughout the SASOL office. In addition, laptops could access the network all trough the SASOL office and the student house next to the office could possibly have access to the network as well.

3.13.10. Backup

New information will be added to the Information Hub on a regular base, so it is important that backups are made on a regular base as well. The best solution would be to use a tape drive for the backup procedure but using a DVD burner could also be a solution. Again, for the backup procedure, second hand hardware bought from the Netherlands could also be used.
As backup is an important point but no means are yet available to comply a proper backup procedure, a limited way of making backups is described in APPENDIX D of the Advanced Admin Guide: Advanced maintenance of the Information Hub.

3.13.11. Power Supply

Currently, a serious lack of power sockets exists at the ICT room of the SASOL office. In fact, there is no power socket at all; the computers are supplied with power by using a power extension cable. Due to the fast increase of electrical devices in the ICT room, it is very important to improve the electrical infrastructure in this room.

3.13.12. Second Hand Hardware

Extra computer and network devices are necessary for the Information Hub Project. On a restricted scale, good quality devices can be found in Nairobi but costs are rather high (prices are equal to those found in Europe). It would be better to buy small devices, like switches, access points, etc. second hand in the Netherlands; a new team that travels to Kitui can carry these devices as they travel from the Netherlands to Kitui.

3.13.13. Information Hub Promotion

To make the Information Hub a success, it is important that it gets a lot of attention. The employees and students working at SASOL should be noticed of the existence of the Information Hub. They should be stimulated to provide the ICT team with documents that could potentially be placed on the Information Hub and they should make the team aware of any inconsistency found on the Information Hub.

The Information Hub Project should be an interactive project, administered by the ICT team but powered by the whole SASOL team!

3.13.14. General

To conclude, a general recommendation about the Information Hub can be given.

It is clear that a lot of work has to be done on the Information Hub. The idea is to make the current form of the Information Hub part of a larger system. What now is named ‘The Information Hub’ should be called something like ‘The Digital Library of the Information Hub’ in the future; the digital library should be part of a larger system with databases, forums, news etc. like the idea of a content management system. The Greenstone software is not suitable to be used for a system like this as it is too specific; the software is only intended to be used for setting up a digital library. The digital library part should be linked from the Information Hub system in the future.

4. School Project (Project 2)

Nowadays, basic computer knowledge is very important. Almost everyone looking for a job needs to have some basic understanding of how to work with a computer. And not only for work one needs to know how to handle a computer, just in general is it very useful when one can work with a computer. Just look at the possibilities of the Internet, which are countless. But without the basic knowledge of a computer it is not possible to make use of the Internet. In the western world, almost everyone does have some basic computer knowledge, especially the younger generation. Schools do have computer lessons in their school program and almost every household owns a computer. However, in a developing country like Kenya, things are completely different. Computers are too expensive for most of the people here and most of the schools do not have

the availability of computers. As a result, too much people do not have the change to acquire basic computer knowledge, which can really be a problem as they are staying behind with the rest of the world. Therefore, SASOL started the School Project. With the School Project, SASOL tries to give the younger generation a chance to get known with computers. SASOL provides the schools with computers and is responsible for teaching the teachers and students the basics of computers.

The School Project started a few years ago. However, SASOL is not completely satisfied with the way the School Project is carried out at the moment, mainly because there is no good improvement in the level of computer knowledge at the schools visited.
To improve this project, some recommendations are made, based on two visits to schools and the general way the School Project is carried out.
This chapter will first describe some general information about the educational system in Kenya. Next, some general information about the visits to the school is given together with a recommendation per school. The chapter will conclude with a general recommendation for improvement of the School Project. A new structure for the School Project is planned, based on these recommendations. The new structure is described in appendix APPENDIX F – New School Structure

4.1. Educational System

The educational system in Kenya is more or less comparable with that of the Netherlands. The first official school one will start is the Primary School, which lasts for 8 years. Children enter the school at the age of 6 and are normally finished when they reach the age of 14. After Primary School one can go to either a Polytechnic School (2 years) or a Secondary School (4 years). The Secondary School has a higher level of education than the Polytechnic School, which is more practically oriented. Normally, when not being qualified for Secondary School, the alternative is to go to a Polytechnic School. A Polytechnic School has less options for subsequent education; the ones that end-up at a Polytechnic are normally very poor and do not have the performance for doing a study on a higher level. Only after several years, when numerous certificates are earned one has the option to pass to University, but this path is very rare to follow.

When finished with Secondary School, either a Higher Level Polytechnic School or College can be done or one can go directly to a University, which depends on the qualifications met at Secondary School). At the University, one can go for their Bachelor and/or Master degree. When not qualified for a University at Secondary School one can go to University after finishing Higher Level Polytechnic School or College.

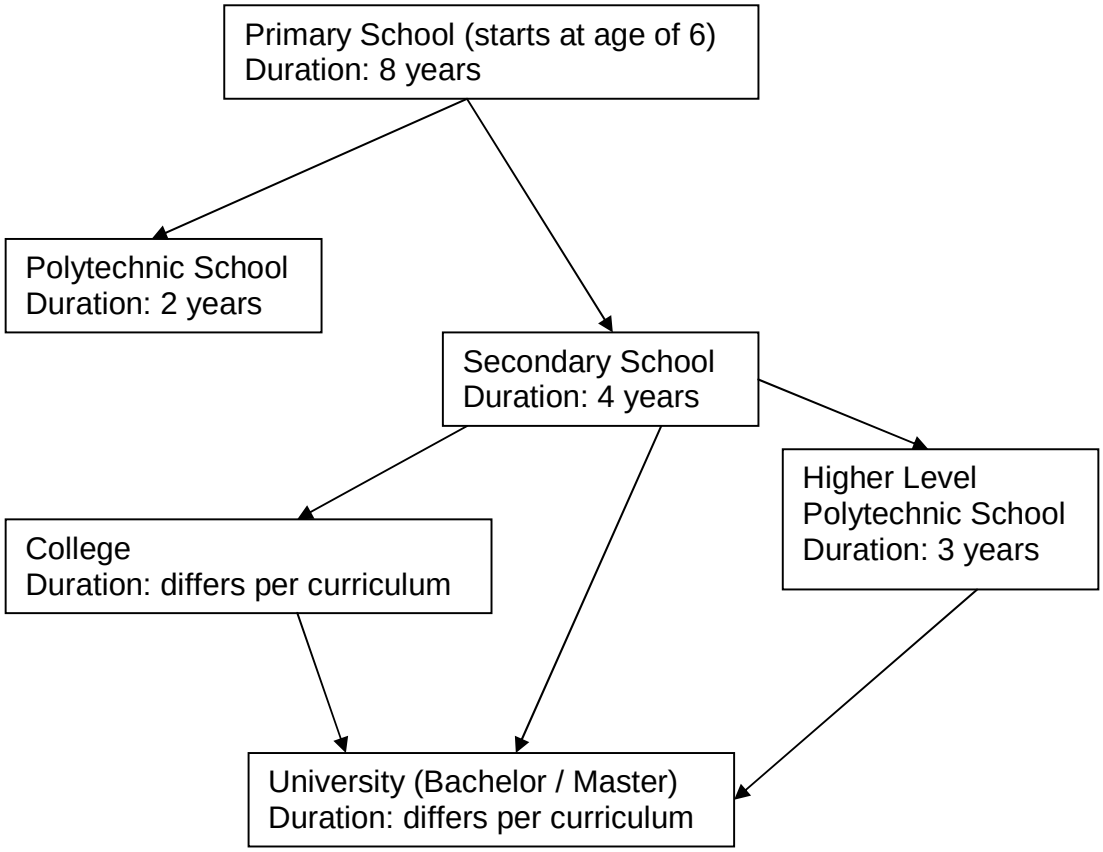

Figure 3. Educational system in Kenya

The schools participating in SASOL's School Project are all Primary, Polytechnic and Secondary schools.

4.2. Gerar Springs Academy, Mutitu

4.2.1. Introduction

Gerar Springs Academy (Primary School) was a pilot project, both in that the school has never been visited by previous ICT teams, so there was completely no computer knowledge yet, but also because this was the first Primary School to be visited by SASOL for the School Project. The pupils who had to be taught were very young, starting from 6 years to around 14 years of age, so maybe some of the pupils could be a little bit too young to be taught computer lessons. But, as described later, it appeared that the age of the pupils was not a problem for most of them.

4.2.2. Environment

Gerar Springs Academy is located in Mutitu, around 75 kilometers on the east of Kitui town. The facilities in Mutitu were very primitive; no electricity, no gas and also much more dry and hot than Kitui Town. Despite this, the building of the Primary School was very good. The building was also very new, only half a year old, and the computer room was the best room in the building; it was the only room with a concrete floor instead of a sand floor, as in the rest of the building. There were even a lot of power sockets in the wall so they considered the use of computers very well while building the school. Unfortunately, the generator to supply the power sockets was not yet connected to the central wiring system of the school, so the sockets could not be used yet to connect the computers. The energy students, who traveled with us to support us couldn't fix the problem right at the place because they didn't have the right tools with them to pull the wires through the walls. As a temporarily solution we had to connect the generator directly to the computers.

4.2.3. Teaching

We only gave the upper classes theory lessons because it would be too difficult for the lower classes. For almost all of the pupils it was the very first time to work with the computer. Most of them had never seen a computer before and therefore some were a little bit afraid to touch the mouse or the power button of the computer, but after a few minutes they were not even slightly afraid anymore: very enthusiastic and they didn't want to stop 'playing' with the computer. Because of their enthusiasm most of the pupils were learning very fast. Only the very young ones were having some difficulties sometimes because they were a little bit too young to understand what they were doing, but they really liked the more simple things like painting.
The handling of the mouse was in the beginning the most difficult for the pupils but by learning them to paint on the computer they learned how to handle the mouse quickly.

We also taught the teachers, in almost the same way as teaching the pupils, as most of the teachers also had never worked with a computer before. Just like the pupils the teachers were also very enthusiastic about working with the computer. Almost every free moment they had they wanted to work with the computer and that is really a positive point for the introduction of computer lessons in the future, taught by the teachers themselves.

4.2.4. Computer Systems

There were no computer systems available yet at Gerar Springs Academy. We piloted a total of 4 computers to the school. Two of them were Pentium 1 computers on which we installed Windows 98, the other two were Pentium 2 computers with Windows XP.

4.2.5. Recommendations

The possibilities for computer lessons in this school are very good. The accommodation is very good and together with the enthusiasm of both teachers and pupils a consistent learning environment could be created. Next teams should especially focus on teaching the teachers, as the teachers on this school really want to learn more about computers and as soon as teachers have a decent knowledge on this area they can start giving computer lessons by themselves.
Next teams or an Energy team also traveling to the school should also take a look at the central wiring system of the school as the generator is not yet connected to it at the time we visited the school. A device to pull wires through wiring pipes would be useful at least because there are some empty pipes at the moment intended to be used for the wires from the generator to the central wiring system.
There is also a UPS available at the school which could not be used at the moment because the right cables are not available at the school. Two 'euro-to-euro' cables (male-female power cable) are needed to connect two computer systems or a computer and a monitor to the UPS.

4.3. Mulango youth Polytechnic

4.3.1. Introduction

Mulango polytechnic is a technical school for both girls and boys. It is not new in SASOL's School Project so it has already been visited by previous ICT teams; therefore we expected the majority of the students to have knowledge in computer basics except the ones in the first year of their college. Because the last ICT team visited the school about half a year ago and in the meantime no lessons were given, we decided to start giving lessons from the basics to refresh their minds.
The age of the students on the Polytechnic school ranges from 14 to 19 years.

4.3.2. Environment

Mulango Polytechnic is located in Mulango, around 7 kilometers from Kitui town. The town is supplied with power from Kitui town and so is the school. Therefore no generator was needed for the computer room. The computer room was good; a lot of space was available and because of the concrete floor the air was not very dusty. There was even a blackboard in the computer room which can be very handy to combine theory lessons with practical lessons.

4.3.3. Teaching

Because of the fact that the students at the Polytechnic school were very practically minded and their educational level was not very high we decided to start with practical lessons to the students. Teaching them theory was probably too difficult for them to understand and therefore a waste of time but when they continue to catch up with the practical part, theory can be given in the future.

Teaching the students was difficult sometimes. They were learning very slowly and it looked like most of them weren't as smart as the pupils of the Gerar primary school which we had visited the previous week. Also their enthusiasm was different; they were much quieter and therefore it was difficult sometimes to estimate if they understand the things we told them. Sometimes it looked like their level of English was also not very high and this could also be a reason for that they didn't understand everything right away we explained to them.

The last two days of our visit to Mulango Polytechnic was used to teach the teachers. There was only one teacher who was very enthusiastic about working with the computer: the principal of the school. Unlike the others, he was also the only one who visited the computer room regularly to 'play' with the computer. Just like the students, the teachers were learning very slowly, only the principal was learning fast.

4.3.4. Computer Systems

There were 2 computers already available at Mulango Polytechnic before our visit. Both computers were Pentium 1 computers with Windows 98 installed. We did an extension 2 3 computers to the school: one Pentium 2 system and one Pentium 3. One of the Pentium 1 computers already at the school was not working at the time we arrived there, so we brought it back to the SASOL office and replaced it with a new Pentium 1.

4.3.5. Recommendations

The accommodation for computer lessons is good. Unfortunately the knowledge and learning capacity of most of the teachers is probably too low to start computer lessons by themselves. Only the principal could potentially give computer lessons, but as compared with the school population one person is not capable to give decent lessons, and also to acquire more computer knowledge by himself, people with more knowledge are needed.

The principal told us that they were planning to hire a computer teacher for giving computer lessons once a week. It would be very positive if they realize this plan but it is doubtful if they really organize these computer lessons on the very short term. The next teams should take a look at the progress of this plan because computer lessons are very important for the students at this school; during the next visit to this school it is very unlikely that the students remember a lot about the lessons we gave them. If it appears that, at the next visit, no progress has been made on hiring a computer teacher, the importance of this should be clarified.

4.4. General Recommendations

After visiting two schools for teaching computer lessons, a general conclusion and a recommendation to the next ICT teams can be made to improve the situation on the School Project in general.
During both our visits we emphasized our work on teaching students. There is nothing wrong with teaching students computer lessons but if there is really a need for continuing progress in improving ICT knowledge things have to be changed. First of all teaching the teachers must become much more important. Currently it seems to be that teaching the teachers is more or less done besides teaching students, only if there is some time left. In fact, exactly the opposite is needed: teach the teachers and if there is some time left it can be used to teach the students to learn them some new things which can make them more enthusiastic about working with the computer.

The reason why it is so important that teachers acquire the knowledge is that the students need to be continuously in touch with working on a computer and not only when the school is visited by an ICT team. This is only possible when there is at least one computer teacher/instructor available at the school. The computer teacher has to instruct the students on a regular basis so that progress can be made and more advanced lessons can be given. If no progress is made on the level of computer education at the schools it is completely useless to give computer lessons. We instructed students at a school already visited by a previous ICT team and almost none of them remembered anything from the previous lessons because it was too long ago, and so we had to start from the beginning again. If the teachers will not be instructed, or no plans are made to offer regular computer courses at their school no progress can be made. And starting over and over again with teaching them the basics doesn’t make any sense.

There are different ways to improve the current state of the school projects. The easiest and most straightforward method is to just swap the roles: start with teaching the teachers and if time remains end with teaching students. But teaching teachers once in a few months only isn’t enough. There definitely needs to be some hard-copy course material so that teachers, or even motivated students, can learn more about computers in their own time and at their own speed. Mostly, when teaching for one week, a lot of material is covered in a small

amount of time. Especially for people with less computer knowledge things can then become very overwhelmingly and therefore at the end of the week they may know what is possible with the computer but don't know anymore how to handle it. The result is that they loose their interest because no one is available to help, they stop working with the computer, loose the knowledge they managed to acquire and have to start over completely from the beginning when the next ICT team arrives. A hard-copy book can support the teachers by improving and maintaining their computer knowledge but it can also be used as a reference for themselves when teaching the students.
It appears to be that there is a syllabus, available at diverse bookstores in the country, for giving computer lessons at Secondary Schools. Next ICT teams should definitely try to get a copy of this syllabus, not only for the Secondary Schools they plan to visit, but also for the Primary or Polytechnic schools because the syllabus could also be handy for self study by the teachers.

Instead of only doing teaching at the schools maybe it is better to start up some kind of collaboration with the teachers; teachers are in fact the persons who have to teach their students and the ICT teams only need to support them with it. When the teachers are engaged in the teaching part the ICT teams will have more time for the organizational part.

Schools who do not have qualified personnel to be considered teaching their students computer lessons should look for external personnel who could visit the schools on a very regular base for teaching computer lessons. This will cost the schools extra money, but maybe this has to be considered to be part of the budget that SASOL has reserved for the ICT projects, because a computer room without a well educated computer instructor has no value over a school without computers.

When teams are planning to visit a school a lot of course material has to be prepared. There is already some course material available about the basics of the computer; this is very useful but is only the theoretical part of the course material. Besides theory, practical exercises or some kind of tutorials which can be used by the teachers or students to start working right away on the computer are also needed. Practical material is in this case much more valuable than theoretical material because the readers can directly try and see what they are reading about. Especially for the people who have never worked with, or even have never heard of a computer, a lot of theory can be much to abstract in the beginning.

A lot of preparation has to be done on the creation of this material but it can even be done from the Netherlands, and not only by ICT students but even students who are doing a pedagogical study can support in this because they have a much better look on how to write proper teaching material.

More strict rules for supplying schools with computers could also be considered to improve the school projects. E.g. a requirement could be that teachers have to follow specific courses on a regular basis given by people from SASOL. When schools do not show enough interest in following computer courses they could not participate in the school projects offered by SASOL; schools have to do some effort to acquire the computers.

Another very important point for the school projects is documentation. There is hardly any documentation available about the previously visited schools. In fact, about every school visited, some kind of dossier should be made of with information about the school, level of knowledge of the teachers and students, things done by previous teams etc. This way it will be much easier for next teams to see the progress of the school and what they can continue with when they plan to visit the school. Also a much clearer view of the school is made and as a result the plans and lessons for a school can be adapted to the needs of it. The dossier could even contain recommendations or guidelines for the teachers they have to accomplish during a specific period. During a next visit the team members could report the points fulfilled and the points that need more attention.

Points for improvement:

- Teaching of teachers
- Creation of more course material, especially practical material
- Acquiring of ICT syllabus
- Dossier about every school visited
- Optionally, more strict rules for supplying schools with computers

5. Recommendations to SASOL

5.1. Information Hub Project

To guarantee the continuity of the Information Hub Project, it is important that the next ICT teams are assigned to maintain the Information Hub. It is not directly necessary that an ICT team or a member of an ICT team is set on a fulltime base on the Information Hub Project but at least once or twice a week, a team member should spend his or her time on the Information Hub to check for the consistency of the information and to add, remove, or change the information on the Information Hub. But, besides maintenance, some full-time or part-time projects (in combination with another project, e.g. the School Project) could be setup to extend and/or improve the Information Hub using the recommendations as described in chapter 3.13, Recommendations to Next ICT Teams.

The (Dutch) student teams, working for SASOL should also be encouraged to provide their reports to the ICT-team, so that they can add the reports the Information Hub; the subsequent student teams are then able to lookup the information of their predecessors.

5.2. School Project

Currently, the School Project is in a phase of reorganization. During the last four months (speaking of June 2006), a lot of changes have been made on the way the School Project is carried out. It can be expected that not all of the planned changes will be realized the way they were planned and therefore it is important to evaluate which of the restructured points are doing well and which not. What is trying to be said with this is that the plans for the new School Project are made but it is not fully tested yet; the value of the new structure can only be measured when they are actually applied to the participating schools. So, things like the contract and the checklist for the yearly audit are very likely to be modified (or better said updated), after testing them on a few schools.

5.3. General

With the start of the Information Hub Project, together with the restructuring of the School Project, some things have been changed on the field of ICT at the SASOL office. The new School Project structure allows less time and less people to be active on visiting the schools. The extra time can and has to be used on coordinating the Information Hub Project and the administrative part of the School Project. It is important that these points get a lot of attention to prevent that the Information Hub Project fails and that the School Project falls back to the old situation.

Computer Desks

Another point to mention is the condition of the computer desks used in the ICT room. The desks are so weak that they have to be squeezed between a wall and a box, otherwise they will collapse. If possible, new desk should be placed here as soon as possible.

6. Recommendations to Ex-change

Communication with SASOL is the major difficulty Ex-change is currently dealing with. It happens too often that a team is assigned a project but at the time they arrive in Kitui it appears that they have to work on something (completely) different. Due to the limited communication means (telephone, email/internet etc.) but also by the completely different culture proper communication is not easy at all. On the field of ICT, Ex-change is working with specialized contact persons in the Netherlands, which is good, because the contact persons can completely coordinate the ICT projects. SASOL does also have an ICT contact person. It would be good if both contact persons (Ex-change's and SASOL's) get in good contact with each other so that the communication can be improved. Coordination is an important point to guarantee the continuality of the projects and should not be the responsibility of the students too much.

7. Personal Conclusion

My internship in Kenya was one great experience and completely different compared to an internship in the Netherlands. As ICT is far from developed in Kenya it was not an easy task to start ICT projects here but it was definitely a challenge.

The School Project was the first project of my internship and it was very nice to do, especially to get in contact with the teachers and the students of the schools. It is also really motivating if you see how enthusiastic they are when visiting their school. Though, it was good that it was not the only project to work on as I think that things can be a little bit monotonous after visiting a few schools, especially when you are a little bit impatient concerned to teaching, as I normally am.

I've also enjoyed the second and major project of my internship: the Information Hub Project. Although on the technical part not the most complex project, it was definitely not an easy project. All of the indirect factors that play a role in setting up the Information Hub, like limited means, cultural differences, working for people with limited or no computer knowledge made the project slowly to progress compared to when you'll do a similar project in the Netherlands. On some moments things were really frustrating. The lack of Internet was for me the biggest struggle to deal with during this project. When working on a software system it is normally very common to use the Internet to download software or looking up information. As Nairobi was the nearest place to download software it took a long time before the required software arrived in Kitui. When no Internet connection is available it becomes really clear how helpful the Internet can be.
It was also not easy to deal with the African culture on one side and the western culture on the other side; working completely between Africans at the SASOL office and having responsibilities to the organizations in the Netherlands at the same time are not easy to match.
Fortunately, the project was not only frustrating; most of the time I've enjoyed working on the project and especially when, after the frustrating moments, things are getting better and you'll see that at the end of the project the people are really happy with the work done, you are satisfied with it twice as much.
Sometimes I wished that I had more time on the project to complete also some other parts of the Information Hub. I made some recommendations for next ICT teams about what can be done to improve or extend the Information Hub and it would have been nice to see these parts implemented as well, but there was just too less time to start working on it.

In general, when looking back, it can be said that I've learned a lot during my stay in Kenya. Especially on the cultural part, how the people are living here and that a lot of things are not as self-evident as we find them in our western world (e.g. electricity, water, food, Internet etc.). Despite the limited resources people have, everyone was looking happy all the time. When having a frustrating moment you'll only have to walk over the streets for a few minutes and you'll be in a complete different mood after a few minutes; people start talking to you,

shaking hands, laughing at you… In fact, it is indescribable what you'll see here when walking trough the streets; a complete different world in which I shall not be able to live for the rest of my live, but for a short period like 4 months it was undoubtedly, and without regret, a great and unforgettable experience!

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9. List of Appendices

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APPENDIX A – Information Hub Analysis

The Digital Library software: Greenstone

The software which will be used for the Information Hub is the Greenstone Digital Library Software. Greenstone is an Open Source web application developed by the New Zealand Digital Library Project at the University of Waikato in relationship with the UNESCO and several NGO's (Non Government Organization). Therefore, the software is commonly used within development organizations.

Why Greenstone

The Information Hub Research report[2] revealed the specific needs of the Information Hub, which are described later on in this chapter. Accordingly to these needs a choice had to be made about using available standard software or the creation of custom-made software.
Custom-made software has some advantages over standard software: it is specifically written for the customer and only has those functions the customer requests making it no more complex than necessary. However, this option is not very likely for this project. Creating software is an expensive job and very time consuming. Because the ICT personnel working at the SASOL office is not skilled enough for developing software and there is no budget for hiring an external software developing company for the creation of the software the only option would be that the software is being created by ICT students who are on an internship. The situation at the SASOL office itself is not good enough for Software Development. The right tools are not available and the lack of Internet makes the creation of software a difficult process. Therefore the software could be developed from the Netherlands. Unfortunately, as soon as the software has to be implemented problems may arise. A software product has to be thoroughly tested, also by the end-users, before it is ready to use. The communication between SASOL and the Netherlands would be very hard and every change which has to be made on the software has to be done from the Netherlands. Due to the bad communication between SASOL and the Netherlands the finalization of the project can be slowed down enormously. With the students going on their internship only for a short period of time it can even destroy the project at the end completely, with a lot of work but no Information Hub at all as a result.

The use of standard software for the Information Hub will therefore be more appropriate. There are a lot of freely available applications which can be used for the Information Hub. Popular applications which are frequently used by companies to spread information to their employees are Content Management Systems (CMS), of which there are dozens available for free. As the only need for the Information Hub is storing information, and a CMS provides normally much more than only that, such a system would be much too complex for

[2] De Informatie Hub, Meryem Touzani, 12 jan 2006

SASOL; the complexity of the Information Hub should be as minimal as possible to keep the functionality uncomplicated and retain to the original goal of the Information Hub.
The Information Hub research describes three different digital library software systems: Koha[3], Greenstone[4] and Dspace[5]. Accordingly to the requirements of the Information Hub (described in the next section) Greenstone appeared to be the most appropriate application for the Information Hub.

A pilot version of the Information Hub will be set up at first. During the pilot phase two milestones have to be reached:

First Milestone

The first mile stone we'll try to work to is a very early stadium of what should be the Information Hub. The basic software which is needed for the Information Hub should be up and running and in fact the elementary subjects of the Information Hub should be working which is adding information to the Information Hub as a supervisor and getting information from the Information Hub as user. Things like a user-friendly system, stability and reliability are not yet very important right now. The most important part of this milestone is the basic functionality of the Information hub.

Second Milestone

The second milestone should be a fully functioning version of a local Information Hub implementation. The local implementation of the Information Hub is intended for use inside the SASOL office. While Internet becomes available the project can be extended to outside the office. But at the second milestone, the Information Hub should be in such a state that an extension of the Information Hub could be done easily. Keywords for this milestone are: functionality, stability, reliability, scalability and user-friendly.

Layout

Besides a good functioning Information Hub an attractive layout is also essential. Because people with less computer knowledge have to work with the Information Hub the interface should be self-explanatory. A simple and clear layout has to be used to accomplish this.

Documentation

Besides creating a working system it is important that a lot of documentation will be created. Next ICT teams will have to continue the work on the Information Hub and they need to know what has happened with the Information Hub in the past, what the current situation is and on which points improvements should be

[3] http://www.koha.org/
[4] http://www.greenstone.org
[5] http://www.dspace.org/

made. Also, the people of SASOL itself need to know how to work with the Information Hub.

The following documentation reports will be created for the Information Hub:

1. Evaluation report
2. Backup possibilities
3. User documentation
4. Administrator documentation
5. Information Hub final report

Evaluation report

An evaluation report will be created when the first milestone (see also: chapter 3.1 First Milestone) has been reached. The evaluation report will contain the following subjects:

- Pro's / con's of Greenstone software
- Current situation of the Information Hub (what's done so far)
- Difficulties faced during first phase of Information Hub
- Things to improve on the information hub

Backup possibilities

It is important that there will come decent backup facilities for the Information Hub as there will be placed a lot of valuable information on it. Reliable backup facilities are costly and, especially with the small budget SASOL is working with, it is not very obvious that expensive, high quality, material can be bought. Therefore, the right decision has to be made between price and quality.
Before deciding what kind of backup facilities will be used for the Information Hub a small research has to be done. The research will look at the facilities that can be used for the Information Hub and concludes with the best option. Also the backup method has to be decided in the research; how often should a backup be made, what files should be backed up etc.

User documentation

A user documentation manual has to be created that the end-users can read to make themselves known finding information on the Information Hub.
A user guide is shipped already with the Greenstone software, but this document is too complex and describes very globally how to work with Greenstone. For the end-users of the Information Hub this one is most likely too difficult to understand. The user documentation to be created has to be specifically for the Information Hub.

Admin manual

Just as the user guide a developer's guide is shipped with the Greenstone software which describes how to modify and maintain the Greenstone software. But also this guide is too global to be used for the Information Hub. An understandable admin manual has to be created which can be used by the users

who maintain the Information Hub. The manual should describe how to add information, but should also contain technical information about the Greenstone software. The manual is intended for both users with less computer knowledge, who simply want to add information, and for users with a more advanced knowledge about computers, who want to change technical parts of the Information Hub.

Final report

When the pilot version of the Information Hub is running a final report will be created which will contain a description about the current situation of the Information Hub and what has been done in the past on the Information Hub. Difficulties, things to improve, recommendations for the next ICT teams who are going to work with the Information Hub will be described in this document.

Requirements for the Information Hub

The Information Hub research report exposed that the following requirements for the Information Hub are needed:

1. Digital library [H]
2. Search function, also by means of categorization [H]
3. Reference to hard copy sources [L]
4. Multi-user system [M]
5. Internet connection [M]
6. Discussion Forum [L]
7. Authorization [H]
8. Printing function [M]

The priority of a point is indicated at the end of each point:
H = High Priority
M = Medium Priority
L = Low Priority

The priorities were not mentioned in the research report, but are based on the current situation at SASOL.

The description of these points and how they will be implemented in the pilot version of the Information Hub are described below.

Digital library

A lot of information (in the form of Word or PDF documents) is currently available at the different computers inside the SASOL office. Lots of valuable information on these computers is not, or rarely, being used by the employees or students who work at SASOL because the information is too difficult to access. By using the Information Hub as a digital library system, the information can be centralized and filtered. Filtering the information is important because not all of the information is appropriate to be placed on the Information Hub. If the information

will not give an added value to the Information Hub, e.g. because of similar information that is already available or the information does not fit in the field SASOL is working, it should not be placed.
The kind of information for the digital library to be placed on the Information Hub will be divers and can be like:

- Old students reports
- General reports
- Planning schemes
- Work plans
- Relevant articles
- Digital books
- Course material
- Project documentation

The digital library is the base subject of the Information Hub and has therefore a high (the highest) priority.

Search function
As the Information Hub will contain a lot of information there needs to be a reliable search function. By default the Greenstone software provides a powerful function to search on specific keywords through the contents of the library. Searching on keywords can be very handy to lookup lots of information but it is not enough if an end-user doesn't know what kind of information is available at the Information Hub. Therefore, another important part of the Information Hub will be the 'categorization' of the information: every document added to the Information Hub will be placed in a specific category, so that an end-user can find all of the information belonging to a specific category. The categories will be structured into different disciplines. The categories to start off with during the pilot implementation of the Information Hub will be as follows:

- Water / water management
- Hydrology
- Agriculture
- Healthcare
- Energy
- ICT
- Lab Technique
- Education

It must be possible to easily add new categories or to add sub-categories to the existing categories by a system administrator. Unfortunately, the Greenstone software doesn't provide a user-friendly way of adding new categories. The different categories inside the Greenstone library are managed through a plain text file, like displayed in the Figure below. Managing (add/change/delete) the categories this way is very prone to errors. Therefore, a small application will be

developed, called the ‘Greenstone Category Editor’ to edit this text file by means of a GUI driven application. The application will be written in the Java language.

```
"Water & Water Management" 1 "Water & Water Management"
"Hydrology" 2 "Hydrology"
"Agriculture" 3 "Agriculture"
"Healthcare" 4 "Healthcare"
"Energy" 5 "Energy"
"ICT" 6 "ICT"
"ICT_TEAM44ICT" 6.1 "Team 44 ICT"
```

Figure 4. - content of categories.txt

The categories text file:
A category stored in a text file contains 3 elements: an identifier, a position and a display name. The identifier is used internally in Greenstone to refer to the category, the position indicates the position within the category hierarchy, e.g. identifier ICT_TEAM44ICT is a subcategory of the ICT category. Finally, the display name is how the category is displayed to the end-user.

The digital library would be useless without a good search function. Therefore, this point has a high priority as well.

Reference to hard copy sources
Hard-Copy documents should also be referenced from the Information Hub. The reference to the hard-copy document should be integrated within the digital documents so that end-users can lookup the reference the same way as they look up the digital documents. Hard-copy references should contain comprehensive information (summary, author, year of publication etc.) about the hard-copy document together with the location where to find the hard-copy document. All of the hard-copy information should be placed in an HTML document.
Preferably, all of the hard-copy documents will be stored in one central location; the reference could then for example point to the bookshelf where the books can be found.

Currently, there are not much hard-copy documents available inside the SASOL office, so this point has low priority at the moment and will most likely be implemented as the pilot version of the Information Hub is (nearly) finished.

Multi-user system
The Information Hub should be accessible by multiple users at the same time. On the software-side this will not be a problem; the software is by default suitable for a multi-user environment because it works with a web interface and is therefore accessible as an Internet site. However, on the hardware-side, some problems may arise. First of all, the SASOL office is not very large, so space for the placement of the computer systems is limited. Second, SASOL is a Non Government Organization and therefore the financial budget for computer systems and network devices is also limited.

During the first phase of the pilot version only one system will be used for the Information Hub. This system will be used as the main Information Hub computer (server). The Greenstone software is provided with his own web server on which the library software, in this case the Information Hub, can be 'hosted'. This way, clients can access the Information Hub through an Internet browser and do not require anything extra to be setup.
There are currently 3 extra computers available which can be used as client systems but they are not going to be used initially because every installation step can be done server-side, thus on the Information Hub server. When the server system is running and the Information Hub can be used for internally use more computer systems can be added to the Information Hub, simply by making network connections between the computers.

Because it is very simple and basically transparent (if it works on one server system it will work on multiple client system as well) to make the Information System a multi-user system, this point has a medium priority.

Internet connection
A computer system without an Internet connection is almost unimaginable nowadays, and so is it for the Information Hub. The ideal situation would be that the Information Hub is accessible over the Internet so that employees or students from SASOL can also find information on the Information Hub from outside the SASOL office. It would also be very handy for students in the Netherlands, before they leave to Kenya. Students' reports and other documents of SASOL can be viewed in advance, which will improve in their preparation phase.
Unfortunately, there is no Internet connection available at the SASOL office and it is not likely that a reliable Internet connection will come in a short period because the whole town lacks of a reliable Internet connection.

Because an Internet connection is very important this point should have high priority. At the same time an Internet connection is not available at the SASOL office, so nothing can be done with it. Therefore, to not completely ignore the Internet part, this point is given medium priority.

Discussion forum
A discussion forum is especially intended for the Dutch students, to let different teams of the same discipline communicate with each other. Most likely, the discussion forum will not be implemented in the Information Hub anymore because there is already a discussion forum available at the Internet site of the Dutch partner organization Ex-change[6]. At least a reference to this forum can be placed on the Information Hub. Consequently, the discussion forum is given a low priority.

[6] www.ex-changer.nl

Authorization
The information has to be constantly provided with new information. It is very important that the content of the Information Hub remains consistent, so a system-administrator or a group of system-administrators has to be assigned to keep the information consistent and up-to-date. The system-administrator should also take a look at the quality of documents to be placed on the Information Hub; the information should give an added value to the Information Hub and the documents have to be formatted in a clear and readable way.
Because information of different disciplines will be placed on the Information Hub the most preferable situation is that there will be a system-administrator for every discipline, or at least one system-administrator per two or three disciplines.
Authorization is not only needed for maintaining the Information Hub. Also for accessing the Information Hub some kind of authorization is necessary; some documents should only be accessible for people of a specific discipline.

Authorization has a high priority because it is necessary to keep the information consistent.

Printing function
It would be convenient if a printing function becomes available for the Information Hub, so that (parts of) reports, articles or other digitally stored information can be printed and taken away from the SASOL office.
On the other hand, because of the low financial budget, it will be not very common to print a lot of information. Because of this, a printing function is given medium priority.

Type of documents

A choice has to be made about the type of documents to be placed on the Information Hub. There are at the moment a lot of documents in PDF or Word format available at the computers of SASOL. The Greenstone software provides different options to make these kinds of documents available to the end-users of the Information Hub. It is possible to add a PDF or Word document to the Information Hub just without modification. This way an end-user can open the files from the Information Hub by clicking it on the screen and the file is opened with the appropriate software application (e.g. Adobe Acrobat Reader or Microsoft Word. The benefit of this method is that the currently available documents can be added to the Information Hub just right away without any modifications. A drawback of this method is that extra software is needed on the computer of the end-user to view the documents. Besides this the documents are not really integrated in the Greenstone software; Greenstone has no idea what the contents of the documents are, unless specified by the user who adds the documents, and therefore it is difficult for the end-user to search through the contents of the Information Hub. Greenstone provides plugins to solve this problem: a Word plugin and a PDF plugin. These plugins can extract text and other information, like the author of the document, title, creation date etc, from the documents and place them in an HTML file. This way the contents of the

documents and other information about the document can be indexed by the Greenstone software so that searching through the contents of the Information Hub will be possible. Besides this, the plugins makes it also possible that the documents are fully integrated in the Greenstone software: no extra software is needed by the end-users to view the documents because the documents are readable completely in HTML now. The navigation options through an HTML document are also more flexible than through a PDF or Word document. It is easier to split up an HTML document in separate sections and make hyperlinks in the document to jump to the different sections of the document. Though, as Word and PDF documents are becoming more and more versatile nowadays, with the integration of HTML like functionality, such as clickable hyperlinks to jump to different sections of the document, the last factor is becoming of less importance.

A very big drawback of converting the PDF or Word documents to HTML is that, unless you thoroughly modify the original document, it is very likely that the document will end up in one big mesh which is very unfriendly for the end-users to read. The cause of this is that the layout, used in the original documents, is very difficult to translate to HTML; tables, alignments, pictures, they are all formatted in a way specific to the format of the document. As HTML is not very flexible, difficulties arise to convert the versatility of different document formats to HTML. Pure text is converted without problems, but as most of the documents use more advanced layouts problems can be expected during the conversion process.

The question now is to either use the plugins to convert the documents to HTML, with the prerequisite that the original documents are carefully modified in a way which made an acceptable conversion to HTML possible, or to simply put the original documents on the Information Hub without the use of the plugins. The best way is to choose a solution in-between these two options: make use of the plugins for extracting text for indexing purposes but provide the end-user with the original PDF or Word documents. The end-user only needs some extra software on his computer to view these documents, but this should not be a very big problem as the software is standard available on almost every computer, and if not the software has to be installed only once. When the documents have to be converted to an acceptable HTML document a lot of preparation has to be done on the original document to make conversion feasible. Besides this, modification is only possible on Word documents, as most of the PDF documents are read-only and therefore cannot be modified. Modification of the documents will also be very difficult in an environment where the computer knowledge is not very high. Advanced knowledge about text editing software is necessary to prepare the documents in such a way that they are ready to convert to HTML. As a result, it will be very likely that the people who will maintain the information on the Information Hub lose their interest in adding new information and consequently a lot of information will not be placed at all.

Available hardware

The best system available at the SASOL Office for the Information Hub is a Pentium III 866 MHz computer with 128 MB of memory and a hard drive capacity of 20GB. The system is powerful enough to be used as server; the only concern is the size of the hard drive. As a lot of information will be placed on the Information Hub, the 20GB will be consumed very quickly. However, for the pilot version it must be enough; the main goal of the pilot version is to make the employees known with the information hub and to test for points of improvement. As soon as the Information Hub will be more integrated in the work process at the SASOL office and more information has to be placed, an extension of the hard drive capacity is definitely needed.

Client systems do not have to be very powerful as most of the work is done server-side. The only need for the client systems is that they have a network card and up-to-date browsing software. Most of the systems at the SASOL office are supplied with a network card so they can be used for the Information Hub directly. The only necessity is that network cables and network devices become available at the office as they are not available yet.

APPENDIX B – Information Hub Admin Guide (basic)

Admin Guide

-

Basic maintenance of the Information Hub

Version 1.0
June 2006

Redmar Atsma

Preface

This admin guide describes the basic knowledge required for maintaining the SASOL Information Hub. The document is divided in two parts. The first part gives some basic information about the Greenstone Librarian Interface, the tool which is used for maintaining the Information Hub. Part 2, the Practical Parts, contains some practical topics about the maintenance of the Information Hub. It is important that administrators read both parts completely to maintain the Information Hub accordingly to the conventions of SASOL.

More advanced topics about the SASOL Information Hub can be found in another other admin guide: 'Advanced Maintenance of the Information Hub (Technical Documentation)'. It is necessary to refer to this guide when extensions or modifications to the Information Hub have to be made. Note that basic programming language and knowledge about HTML is a prerequisite before reading this guide.

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Part 1 - Basics of the Greenstone Librarian Interface

1. Greenstone Librarian Interface

Greenstone can be used to produce *Digital Library Collections*. A Digital Library Collection can be seen as a collection of digital documents, videos, images and audio. Maintaining a document in Greenstone is done by the *Greenstone Librarian Interface*.

This chapter describes the basic theory which is needed to understand the Greenstone Librarian Interface to extend and maintain the information of the Information Hub.

1.1. Gather panel

When the Greenstone Librarian Interface has been started, by clicking the Greenstone Librarian Interface icon on the desktop (or by clicking Start ⇨ Programs ⇨ Greenstone Digital Library Software ⇨ Greenstone Librarian Interface) the *Gather panel* will be displayed at first. Figure 5 shows the main components of this panel, which are described below.

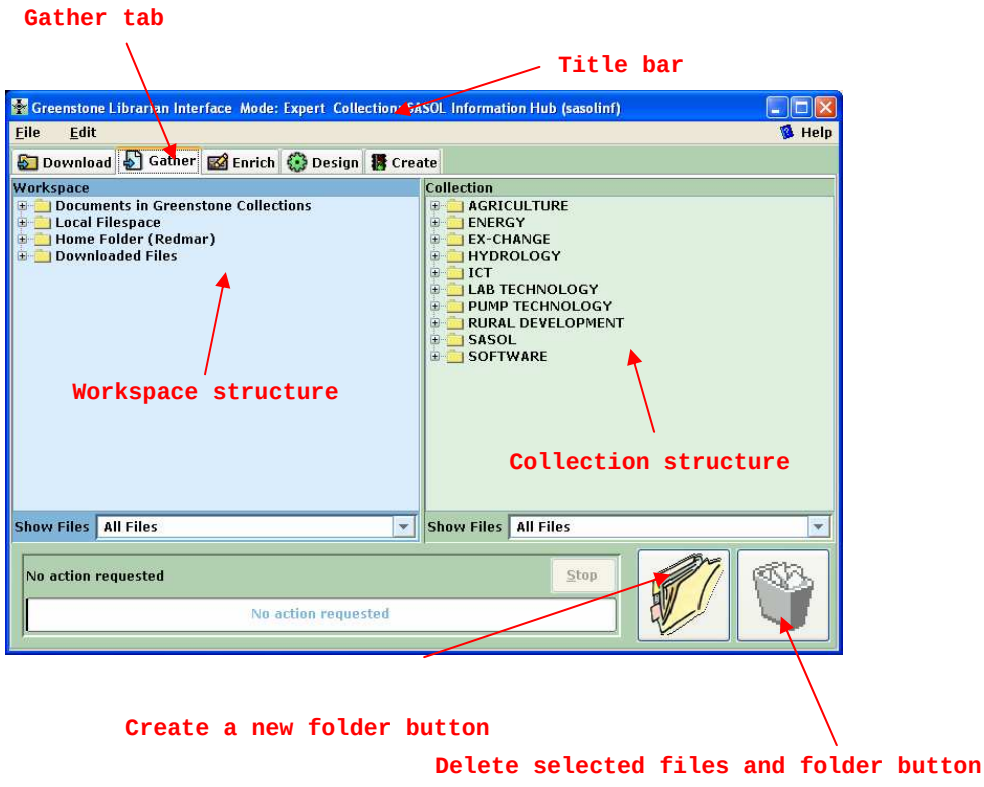


Figure 5. The Gather panel

1.1.1. Title bar

The `Title bar` gives, just like every other window application, the title of the application. In the Greenstone Librarian Interface, besides the title of the application, some more information can be found. First the mode the application

is running in is noted here. In Figure 5, the application is running in Expert mode. Expert mode means that the complete functionality of the application can be used. Other modes are less advanced and do restrict some parts of the application to prevent the chance of making changes accidentally.
Besides the mode, the `Title bar` shows which collection is currently being loaded for editing. As in Figure 5, can be found, the *SASOL Information Hub (sasolinf)* collection has been loaded.

1.1.2. Gather tab

The `Gather tab` is some kind of button which can be used to return to the Gather panel if another panel than the Gather panel is active.

1.1.3. Workspace structure

The `Workspace structure` displays the contents of the local computer. Like in Windows Explorer, a user can browse trough the contents by means of a folder structure. The two most important folders in the `Workspace structure` are the Local Filespace and the Home Folder. Local Filespace can be compared with My Computer in Windows. You can use this folder to access any file on the computer. The Home Folder is just as what it is named: the home folder of the user working at the computer and can, for example, be used for quickly accessing the My Documents folder.
The remaining two folders are less commonly used. Documents in Greenstone Collections contain all of the collection files used in the different collections of Greenstone and Downloaded Files contain files downloaded from the Internet by the Greenstone Librarian Interface, which can be used to place in a collection later on.

1.1.4. Collection structure

The `Collection structure` displays the contents of the active collection. The structure looks like that of the `Workspace structure` but is limited to the contents of the active collection. Adding files to the active collection can be done by simply dragging a file from the `Workspace structure` to the `Collection structure`. When dragging a file from the `Workspace structure` to the `Collection structure` a copy of the file is made. This means that, if the file is deleted from the collection, it will not be deleted from the workspace (or local computer). This way, the files in the `Collection structure` are completely separated from the files in the `Workspace structure`.

1.1.5. Create a new folder button

The `Create a new folder button` is used to create a new folder inside the `Collection structure` or to create a new subfolder within another folder of the `Collection structure`.

As an alternative, the right mouse button can be used. Clicking on a folder with the right mouse button shows a popup menu from which a new folder can be created. The folder will be created inside the selected folder. For creating a root

folder (a folder without a parent folder, like ENERGY, or LAB TECHNOLOGY in Figure 5), an empty area of the `Collection structure` should be clicked with the right mouse button.

1.1.6. Delete selected files and folders button

The `Delete selected files and folders button` is used to delete the selected files and/or (sub)folders inside the `Collection structure`.

1.2. Enrich panel

A document can be enriched with *Metadata* in the *Enrich panel*. The Enrich panel can be accessed by pressing the `Enrich tab`.
Metadata can be seen as data about data, or, within the Greenstone software, extra information about a file in a collection. When an end-user looks up a document on the Information Hub some extra information about the document, like the title of the document and a short description about the document is given. This information is stored as data in *Metatags*, which forms the Metadata.

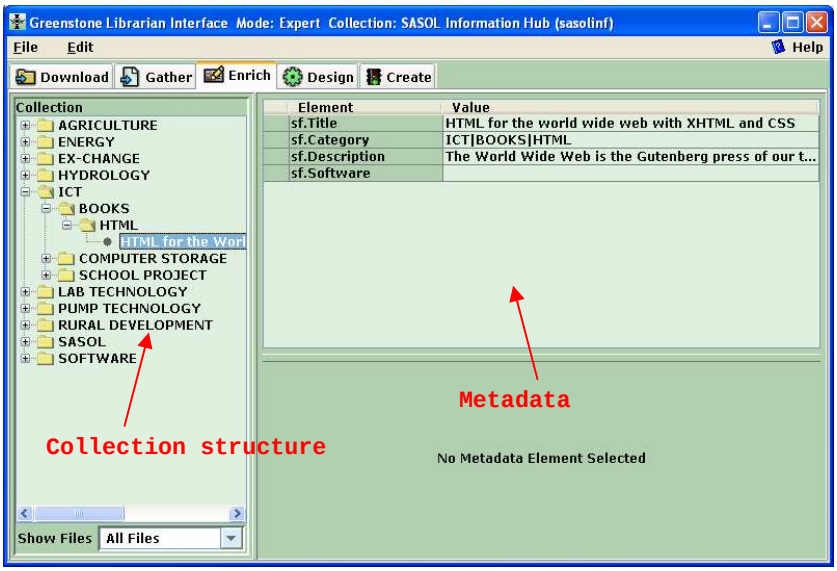


Figure 6. The Enrich panel

Taking a look at the Enrich panel, the `Collection structure` can be found again on the left. A file can be selected in the `Collection structure` for which the Metadata has to be filled. The Metadata can be filled at the area on the right, where an input field for every Metatag element is found.

Note that the tabs for the different panels are also visible on this panel; the same can be said about the `Title bar`. These parts of the application are always visible, no matter which panel (Gather, Enrich etc.) is active.

1.3. Create panel

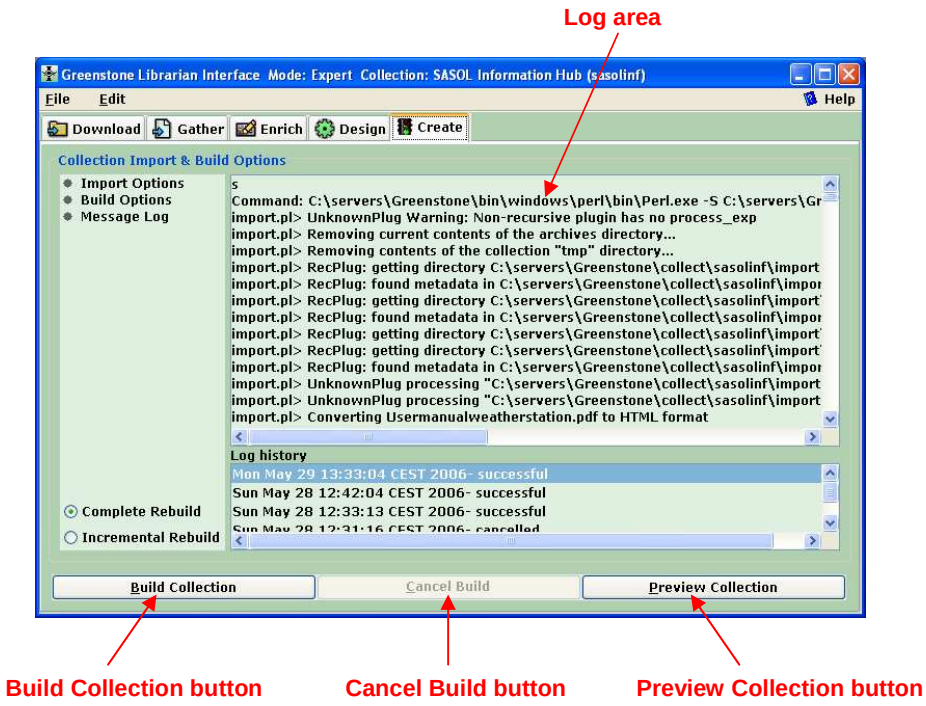


Figure 7. The Create panel

When all of the information for the Information Hub has been collected the collection can be build in the *Create panel* by pressing the `Build Collection button`. Building can take a while depending on the size of the collection; from less than one minute to several hours. Fortunately, the build process can be done completely in the background. This means that the computer and even the Information Hub can be used while building.
The `log area` displays build information during the build process. Normally, the information displayed here is of less importance, but when errors arise during the build process the possible reason of this can be found in this log.
The `Preview Collection` button becomes active when the build process has been finished. Clicking the `Preview Collection button` opens the collection that has just been build.
The `Cancel Build button` can be used during the build process, simply to cancel the building.

Part 2 - Practical Parts

2. Adding documents to the Information Hub

2.1. Importing a document to the Librarian Interface

Make the Greenstone Librarian Interface Window visible by clicking the Greenstone Librarian Interface icon on the taskbar (refer to chapter 5 Starting the Greenstone Server for more details about starting and activating the Greenstone Librarian Interface).

Be aware that there are two Greenstone Librarian Interface icons on the taskbar; try both if not sure which one to take. The Window will look like the one displayed in Figure 8.

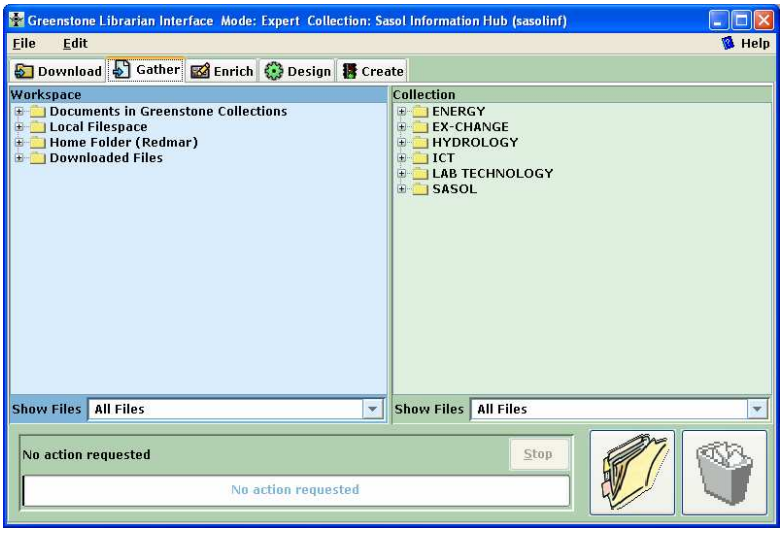


Figure 8. Greenstone Librarian Interface Window

Make sure that the *SASOL Information Hub (sasolinf)* collection is loaded. To verify this, check the blue title bar at the top of the Window which should contain: *Collection: SASOL Information Hub (sasolinf)*.

Figure 9. Title bar indicating that the SASOL Information Hub collection is loaded

If another collection than the SASOL Information Hub collection is loaded follow the instructions as described in chapter '4 Open a collection' to open the right collection.

At startup, the Greenstone Librarian Interface shows two folder structures: `Workspace` (left) and `Collection` (right). The one on the left is showing the contents of the computer and the one on the right shows the contents of the SASOL Information Hub collection.

Now, we are going to add an example file from the `Workspace` to our SASOL Information Hub `collection`. The example file we are going to add is located in the folder 'toAdd' on the C-drive of the computer ('C:\toAdd') and is named 'Greenstone tutorial.pdf'. The document contains, as the name implies, a tutorial about Greenstone.

Note that the file used in this text is just an example file and that we can add every file available on the computer exactly the same way, only the location to find the original file is different.

In our `Workspace`, some folders are listed, like `Documents in Greenstone Collectons`, `Local Filespace`, `Home Folder` and some other folders may be listed here.
By opening the folder `Local Filespace` we can access the C-drive of the computer. First we have to click on the small plus sign on the left-side of the `Local Filespace` folder to open this folder. Consequently we can open the C-drive ('C:\') and next the folder 'toAdd' exactly the same way.
When done properly, the contents of the folder 'toAdd' is displayed. In this case the folder contains only one document: 'Greenstone tutorial.pdf' as displayed in Figure 10.

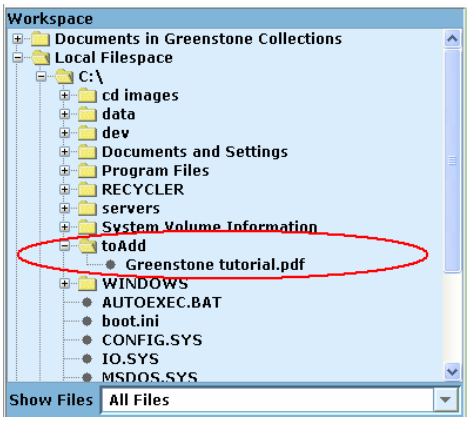


Figure 10. The folder 'toAdd' opened

Note that the contents of Figure 10 may look different on another computer and the steps to reach the original document depend on the location where the document is located. Thus, a document located at another location may require other steps to reach.

Now we are going to take a look at the folder structure on the right: the `Collection`, where the files of our collection can be found. We have to open the (sub)folder where we want to place our document. In our case we want to add our document under the folder ICT, subfolder TUTORIALS.

To make our subfolder visible we are going to open the ICT category, again with the plus sign and then we open the subfolder TUTORIALS, as shown in Figure 11.

If the folder where we want to place our file is not yet available we need to create this folder in our collection. If you do not know how to create a new folder take a look at chapter '3 Creating/removing folder categories'.

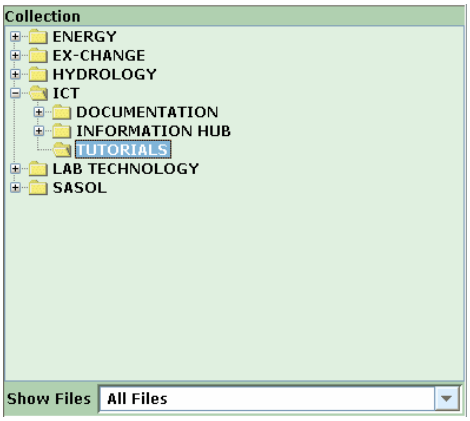


Figure 11. The subcategory TUTORIALS opened

Now we are going to drag the original document from our `Workspace` to the appropriate folder in our `Collection`. So, in this example, we are going the drag the file 'Greenstone tutorial.pdf' from the `Workspace` to the TUTORIALS folder of our collection, as shown in Figure 12.

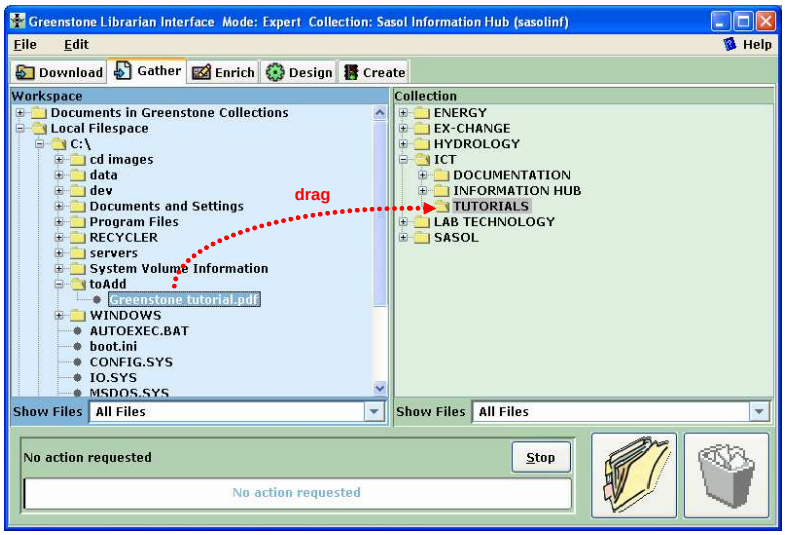


Figure 12. Drag a file to TUTORIALS folder in the collection

When done properly, the original file is now displayed inside the Collection, like in Figure 13.

When the file is not visible after dragging, the destination folder is possibly not yet expanded. To do this press the plus sign on the left-side of the destination folder. If this doesn't work, the file is most likely not dragged to the right location. Check to see if the file is dragged to another location by accident and then drag the file to the appropriate location.

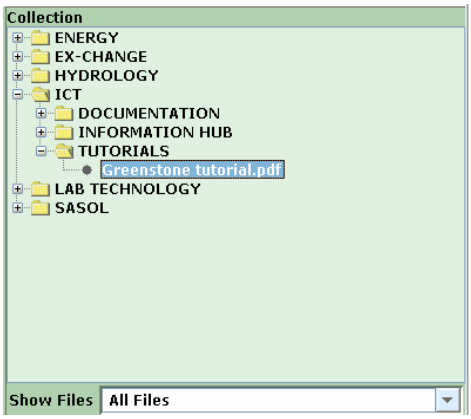


Figure 13. 'Greenstone tutorial.pdf' placed in the TUTORIALS folder

2.2. Enriching the imported document with metadata

Now that we have imported our document to the Information Hub, the next step is to enrich the document with extra information, also called *metadata*, to make it easier to find the document later on.

Metadata can be added in the *Enrich panel*. To reach this panel, click the `Enrich tab`, as shown in Figure 14.

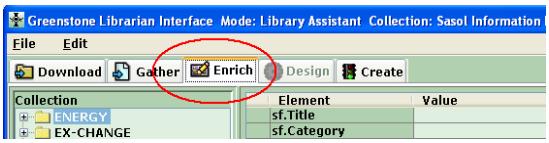


Figure 14. The Enrich tab

In the Enrich panel, the `Collection structure` can be found again, this time on the left side. We have to find our just added document again in this structure and select it by clicking it once.

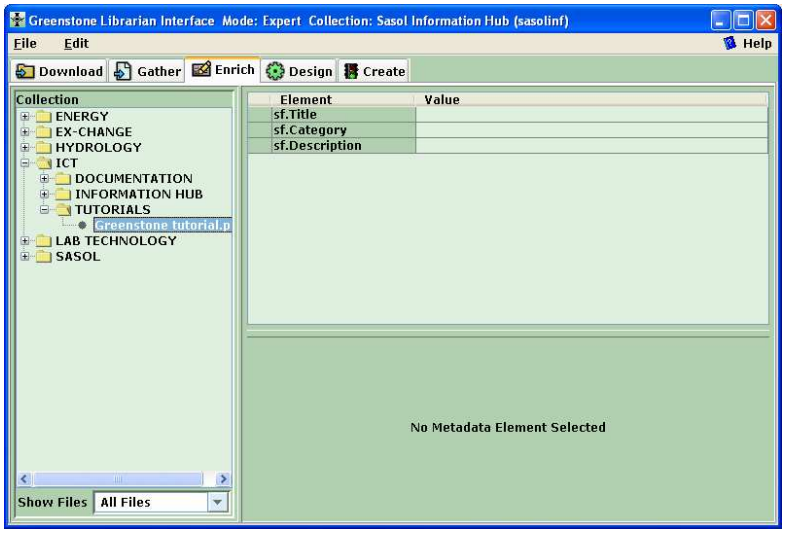


Figure 15. The Enrich panel, with our document selected

We have to give some information about the just added document. On the right side of the panel we find some input fields where we can fill the metadata for our selected document.

Before filling the input fields recheck that the document we want to fill the information for is selected in the `Collection structure`.

The `sf.Title` field represents the Title of the document and will be displayed in the Information Hub as the document title. In our case we are going to give the title 'Greenstone tutorial' (without the quotes).

The `sf.Category` field is used to specify in which category the document in the Information Hub is placed. Our example document will be placed in the category ICT then subcategory TUTORIALS. In the `sf.Category` field we specify this as:

ICT|TUTORIALS

Note the vertical line | between the ICT category and the TUTORIALS subcategory.

Make sure that everything written down in the sf.Category field is written in upper-case. This is necessary because the Greenstone software sorts case-sensitive.

Tip
There is a very convenient alternative for filling the `sf.Category` field but this one is only possible when the category is already available on the Information Hub:

Clicking the `sf.Category` input field shows the `Existing values for sf.Category` panel in the lower right corner of the Enrich panel. This panel shows the complete category structure of the Information Hub. The category the new file has to be added can be clicked from here; the `sf.Category` field will be filled automatically.
Though, when a complete new category has to be assigned to the Information Hub, the `sf.Category` field has to be filled by hand.

Tip
A document can be assigned to multiple categories. After filling the `sf.Category` field, when pressing the <Enter> button on the keyboard, a new `sf.Category` field can be filled.
As a convenience, the first category should correspond with the folder structure of the `Collection structure`.

The `sf.Description` field has to be filled with a short description about the contents of the document. We will give the following description to the document (again without the quotes):
'A tutorial about Greenstone which describes the working of the Greenstone software.'

Finally, the panel should look like this:

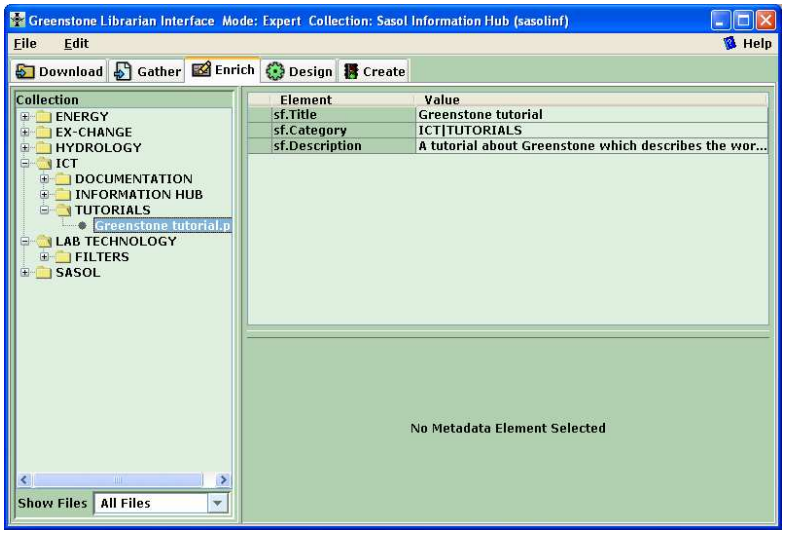


Figure 16. The Enrich panel filled with data

All the information is collected now and we are ready to produce the updated Information Hub collection. We need to go to the Create panel by clicking the Create tab.
In the Create panel we press the `Build Collection button` to produce the updated collection. It will take some time to build. When the build process is finished you can press the `Preview Collection button` to preview the updated collection.

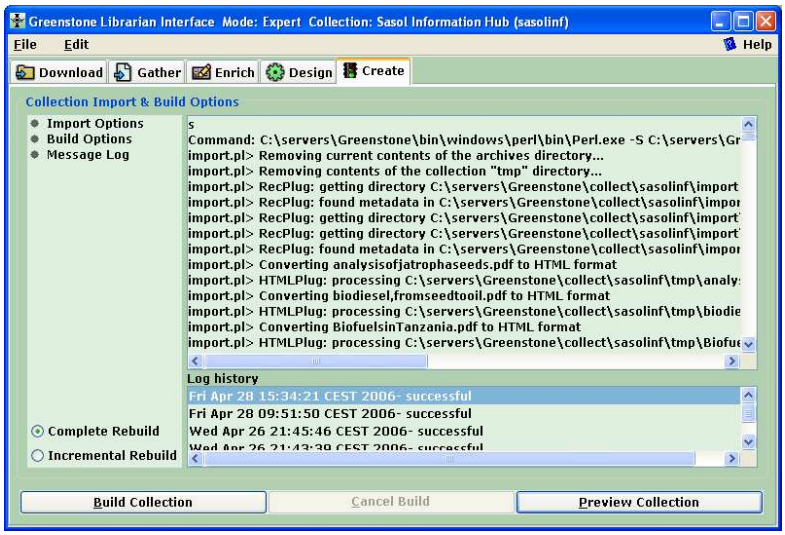


Figure 17. Build panel when the build process is finished

3. Creating/removing folder categories

The Greenstone software offers the ability to categorize all of the information that is placed on the Information Hub. As a lot of information will be placed on the Information Hub it is vital to make use of this functionality to provide the end-user with the information in an organized way.

To get a good overview of what happens on the Information Hub to the end-user and what happens behind the scenes of the Information Hub (how are the documents organized to the Information Hub administrator) it is convenient to organize the documents behind the scenes corresponding to the categories they belong to. This may sound a little bit confusing so therefore we will take a closer look at how the documents are organized behind the scenes, compared to how they are provided to the end-users.

First, we are going to take a look at how the documents of the Information Hub are organized to an end-user. When an end-user browses trough the categories of the Information Hub he or she will, at first, start with some main categories, like the categories as displayed in Figure 18. The categories are placed in, what is called, a *hierarchical* list. This means that a category may contain one or more subcategories. An end-user can expand the contents of a category by clicking on it, as shown in Figure 19.

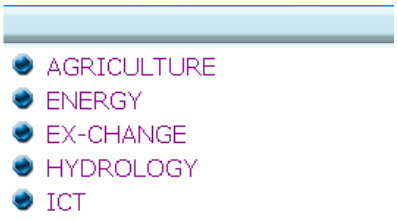


Figure 18. Main categories

Figure 19. The contents of category ENERGY, subcategory JATROPHA displayed

For an administrator, the things are a little bit different. An administrator normally works in the Librarian Interface to maintain the contents of the Information Hub. The organization of the documents in categories is done by means of Metatags (Information about the documents). In the Enrich panel of the Librarian Interface

(under the Enrich tab) the metatag `sf.Category` can be filled for a specific document. If a document belongs to the category ENERGY, subcategory JATROPHA, like the documents in Figure 19, the administrator gives the `sf.Category` metatag the value ENERGY|JATROPHA, like in Figure 20.

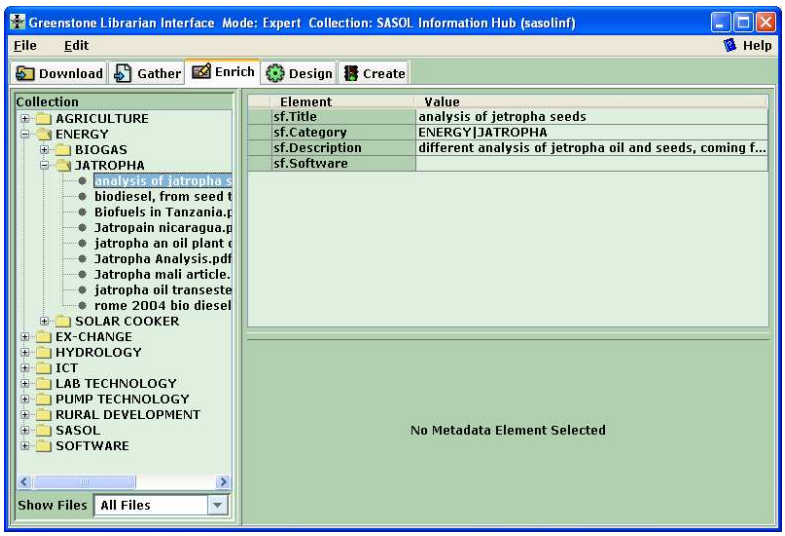


Figure 20. A file under category ENERGY, subcategory JATROPHA, now in the Librarian Interface

In the Collection overview, visible under both the Gather tab and the Enrich tab, all of the documents of the Information Hub are organized. The documents can be placed in folders to give more structure to the administrator. The best way for the Information Hub is to produce the same folder structure as the category structure is to the end-user. This way it will be much easier for an administrator to find the documents back, later on.

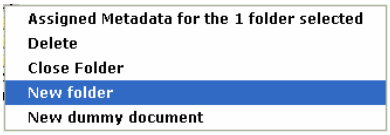
So a document, belonging to the category ENERGY|JATROPHA can be placed in the folder ENERGY, but it is clearer to place the document in a folder JATROPHA within the folder ENERGY, like the document selected in Figure 20. Thus, the Collection folder structure has nothing to do at all with the category of the document but, by organizing the documents the same way as the category structure, finding the documents back later on will be much more easy.

The following steps are required for adding a new folder to the `Collection structure`.

Creating a new folder in the Collection overview is easy. First make sure that the Gather panel is active (under the Gather tab). By right clicking an empty area in the Collection structure a popup menu will appear:

Choosing `New folder` gives a small Window in which the name of the folder has to be given. The best way is to type the folder name completely in uppercase as the categories are also completely in uppercase. The reason for this is that, in the Greenstone software, the categories are sorted case sensitive. When mixing uppercase with lowercase characters, the sorting of the categories can be mixed up.

Subfolders can be created in almost the same way. By right clicking the parent folder, in which the subfolder has to be placed, another popup menu will appear:



Again, we choose the option New `folder`.

Deleting a folder works similar: right click the (sub)folder and then choose the Delete option from the popup menu.

The next example shows the steps needed to add a new folder and consequently the addition of a subfolder in the newly created folder.

Example:

Suppose we have a document that we want to categorize under the category ICT, subcategory TUTORIALS. As we want the category structure to correspond with the Collection's folder structure we are going to add a new folder called ICT with a subfolder TUTORIALS to our Collection overview.

The Greenstone Librarian Interface has to be opened and the Gather panel should be activated. In the Collection structure we have to click with the right mouse button on an empty area so that a popup menu with two options appears, like in Figure 21

When we choose the New folder option in the popup menu a new Window appears. For a new main folder, like ICT, the `Destination Folder` field in this window should contain the text 'import'. For a new subfolder, the `Destination Folder` field should correspond with the name of the parent folder, like we will see later on when we create the TUTORIALS subcategory.

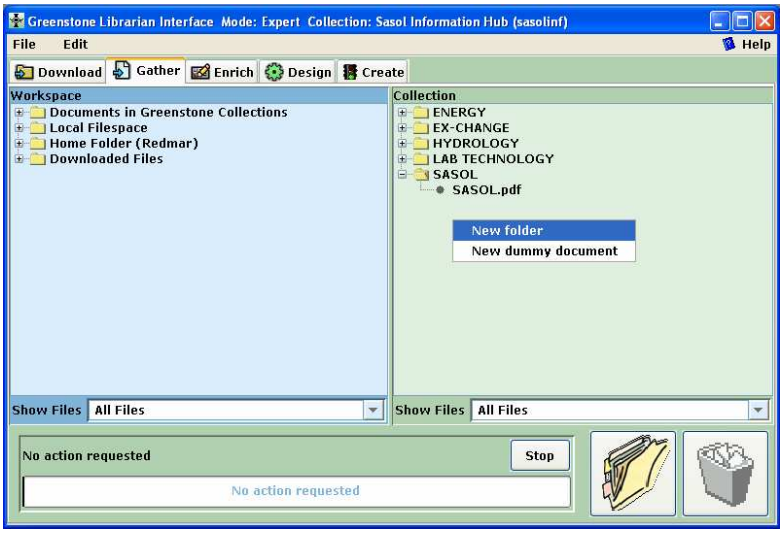


Figure 21. Create a new folder

Figure 22, the new folder will be named 'ICT'

In the Folder Name input field we type the name of the new folder in this case we type the name 'ICT', without the quotes, as shown in Figure 22.
After pressing the OK button the just created folder appears in the Collection structure. When we right click the ICT folder another popup menu will appear where we choose the option New folder again to create a subfolder of ICT.

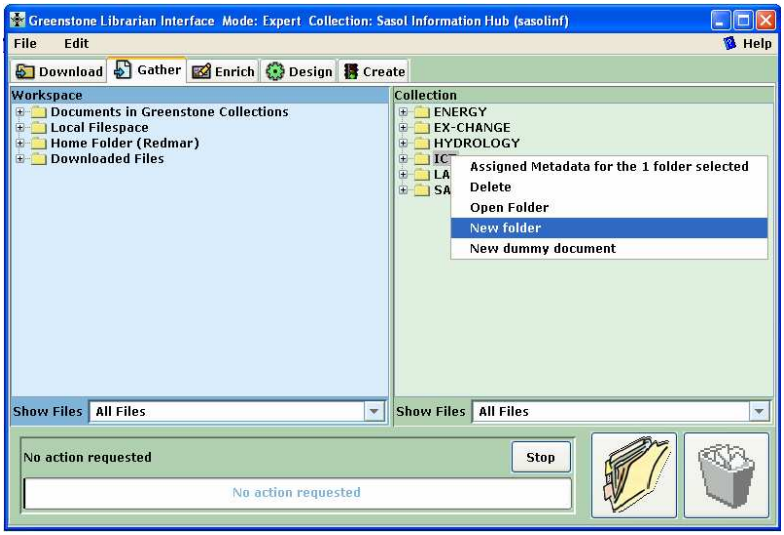


Figure 23, create a subfolder of ICT

Again, a Window appears in which we have to give a name for the folder. Check that the `Destination Folder` field contains the name of the parent folder, ICT, in this case. Then, in the Folder Name field we type ‘TUTORIALS’, again without the quotes and completely uppercase.

Now we have created the subfolder TUTORIALS, inside the parent folder ICT. Documents of the category ICT, subcategory TUTORIALS (ICT|TUTORIALS in Greenstone language) can be placed in the TUTORIALS subfolder to correspond their category.

4. Open a collection

Open the Greenstone Librarian Interface by double clicking the Greenstone Librarian Interface icon on the Desktop.

Figure 24, Greenstone Librarian Interface Icon

After a few seconds the main Window of the Greenstone Librarian Interface appears.

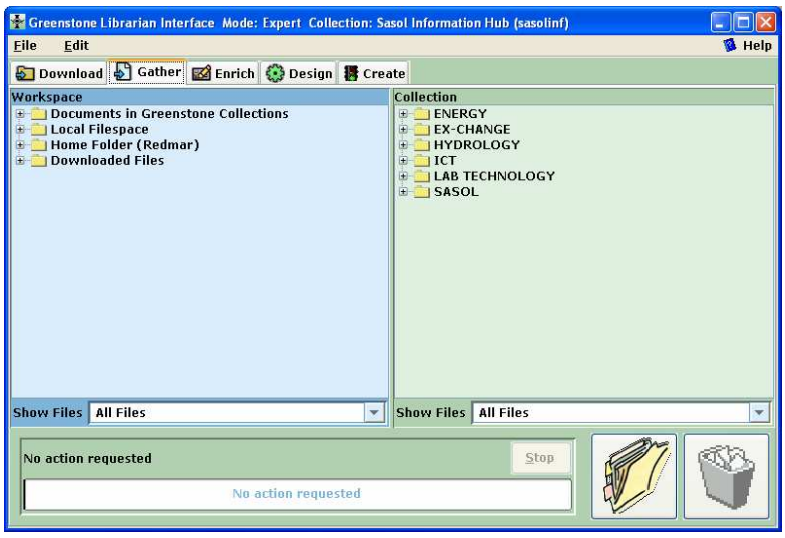


Figure 25, main Window of the Greenstone Librarian Interface

To open the SASOL Information Hub collection, first click `File` in the menubar, then choose `Open`…

`Now the Open Greenstone Collection window comes up.`

In this window, under `Available Collections` we choose `SASOL Information Hub (sasolinf)` and click the Open button.

After a few seconds, the collection is loaded.

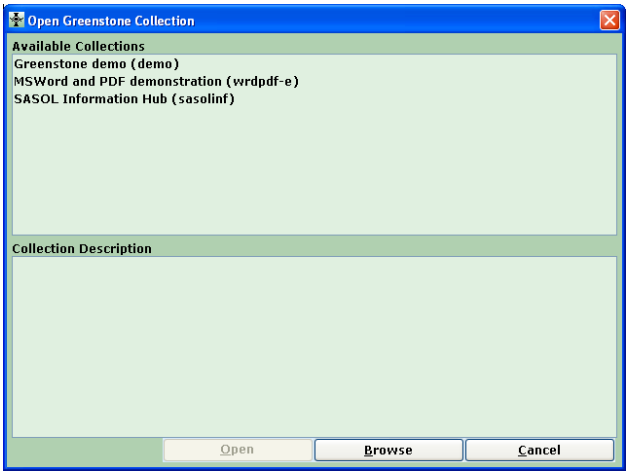


Figure 26. Open Greenstone Collection window

5. Starting the Greenstone Server

Normally, when the Information Hub server systems starts, the Greenstone software will start automatically and the server is up and running.

When loaded correctly, three icons should be visible in the Windows taskbar, as displayed in Figure 27.

Figure 27. The Greenstone icons in the taskbar

Only one icon in the taskbar, the one with the CD (the middle one in the figure above), indicates that the Greenstone Server is loaded. The other two icons are for the Greenstone Librarian Interface and are in fact not necessary for the server to work.
The reason why the Greenstone Librarian Interface is loaded together with the Greenstone Server is to prevent some serious errors during the rebuild of the library. It is necessary that, when new files are added to the Information Hub, the Information Hub is still accessible. When the Greenstone Librarian Interface is being loaded so that new files can be added, the Greenstone Server is loaded automatically, but not when the Greenstone Server is already active.
When building is finished the Greenstone Librarian Interface needs to restart the Greenstone Server, but it appears that this occasionally doesn't work properly if the Greenstone Server is not loaded together with the Librarian Interface. An error message is shown and hereafter the Information Hub isn't accessible at all. To make the Information Hub accessible again the rebuild has to be started completely from the beginning. This can be a problem as the rebuild can take for hours and so the Information Hub isn't accessible for hours.

Therefore, it is better to just start the Greenstone Librarian Interface; everything needed is loaded then and serious problems during the rebuild are excluded.

If the Greenstone Librarian Interface is not yet loaded, it can be started manually by clicking the Greenstone Librarian Interface icon on the Desktop.

Figure 28. The Greenstone Librarian Interface Icon

To stop the Greenstone Server, click the Greenstone Server icon on the taskbar (the one with the CD icon), to make the Greenstone Server Window visible, then point File and then Exit.

Greenstone Digital Library Software
File
GREENSTONE DIGITAL LIBRARY
version 2.63
Press the 'Restart Library' button to start a browser and enter library
Restart Library

Figure 29. Greenstone Server Window

The Librarian Interface can be stopped exactly the same way: click the Greenstone Librarian Interface icon on the taskbar to make it visible, point File and then Exit.

Be aware that there are two Greenstone Librarian Interface icons on the taskbar: one will open a DOS box and the other one will open the Greenstone Librarian Interface Window. Always take the last one that looks like the one displayed in Figure 30.

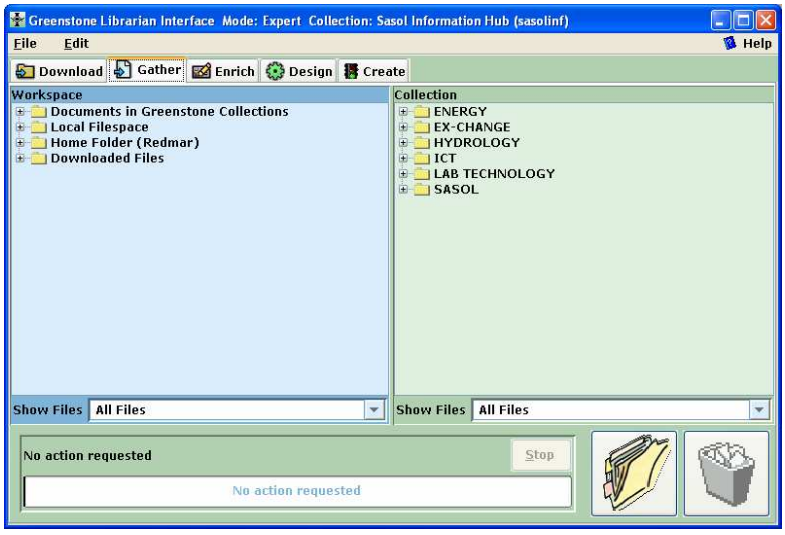
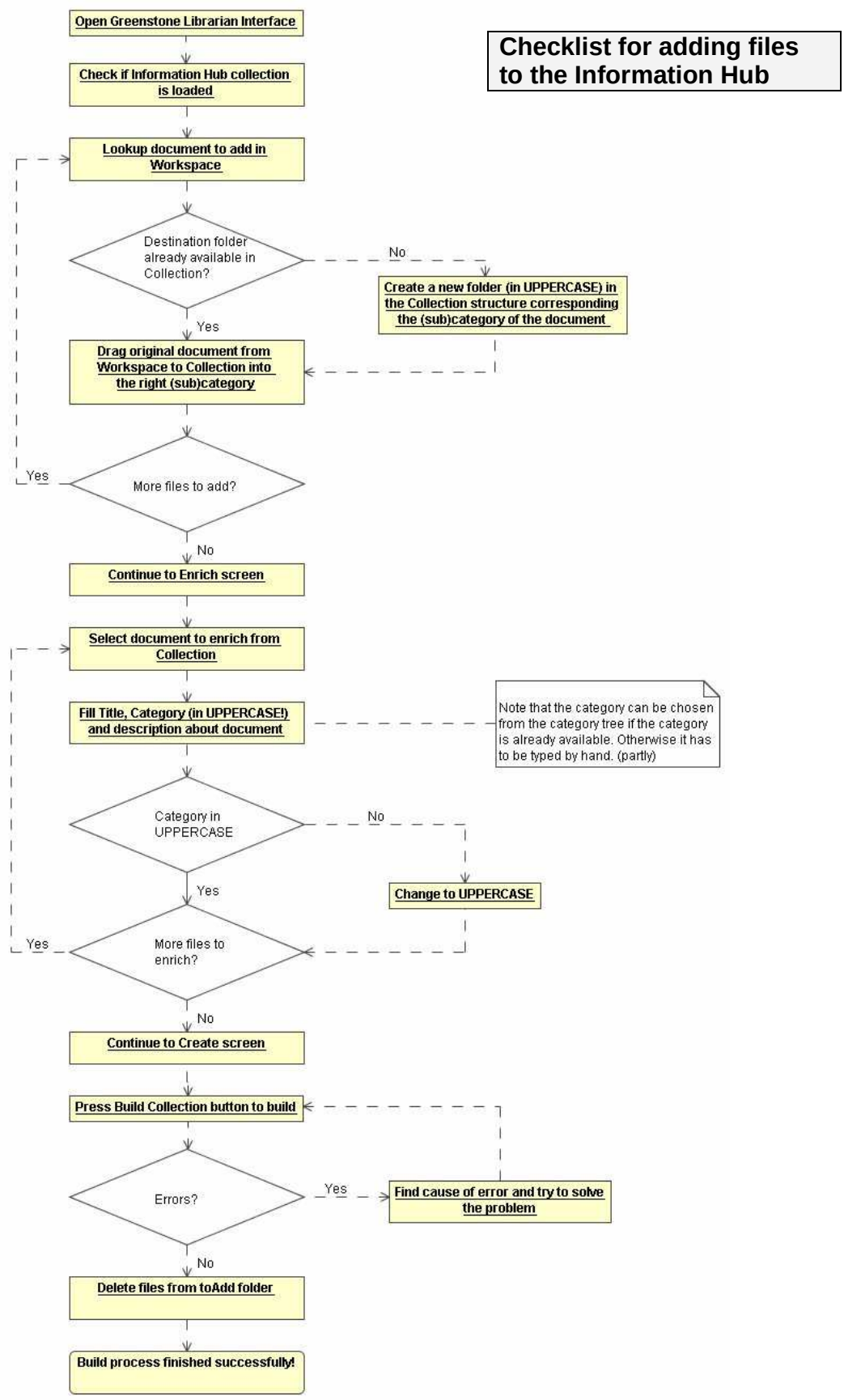


Figure 30. Greenstone Librarian Interface Window

APPENDIX A – Add new files checklist


Checklist for adding files to the Information Hub
Open Greenstone Librarian Interface
Check if Information Hub collection is loaded
Lookup document to add in Workspace
Destination folder already available in Collection?
No
Create a new folder (in UPPERCASE) in the Collection structure corresponding the (sub)category of the document
Yes
Drag original document from Workspace to Collection into the right (sub)category
More files to add?
Yes
No
Continue to Enrich screen
Select document to enrich from Collection
Fill Title, Category (in UPPERCASE!) and description about document
Note that the category can be chosen from the category tree if the category is already available. Otherwise it has to be typed by hand. (partly)
Category in UPPERCASE
No
Change to UPPERCASE
Yes
More files to enrich?
Yes
No
Continue to Create screen
Press Build Collection button to build
Errors?
Yes
Find cause of error and try to solve the problem
No
Delete files from toAdd folder
Build process finished successfully!

APPENDIX C – Information Hub Admin Guide (advanced, with technical documentation)

Admin Guide

-

Advanced maintenance of the Information Hub (Technical Documentation)

Version 1.0
June 2006

Redmar Atsma

Preface

This document describes the technical parts of the Greenstone Digital Library Software and the SASOL Information Hub. The document is divided into two parts; the first part gives some technical background information about the Greenstone Digital Library Software, the second part describes the technical details about the implementation of the SASOL Information Hub in particular and is required for advanced maintenance of the Information Hub.

More in-depth information about parts of the Greenstone Digital Library Software not implemented in the SASOL Information Hub can be found in the documentation accompanied with the Greenstone Digital Library Software.

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Part 1 – Greenstone background information

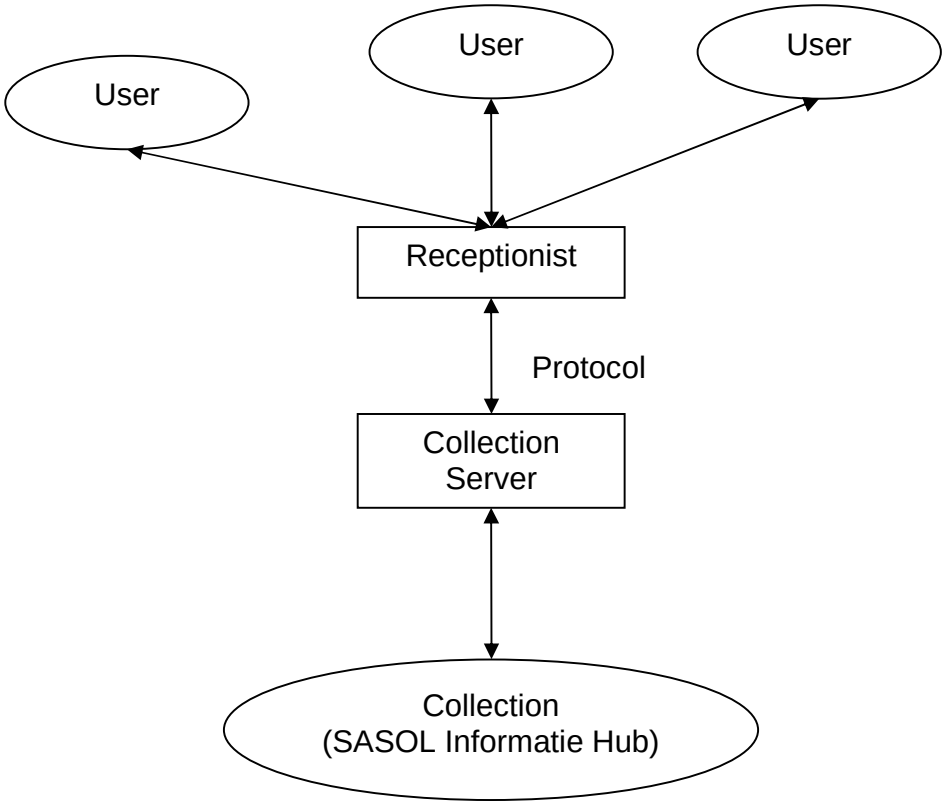

Figure 31. Structure of the Greenstone Runtime System

1. Greenstone Runtime System

The Greenstone Runtime System, written in C++, forms the core of the Greenstone Digital Library Software (shortened to Greenstone software from now). As the system is open source and the use of inheritance is common, it is relatively easy to extend or modify the runtime system.
The main components of the Runtime System are formed by a *Receptionist*, a *Collection Server* and the *Collection* itself.

The Receptionist is the interface for the end-user to the Library collection. All of the user interaction is passed to the Receptionist who handles it. A request from a user to look up some information from the library is handled by the Receptionist at first after which it is send, by means of a protocol, to the Collection Server. The Collection Server in turn is responsible for looking up the appropriate information from the Collection and passes it back to the Receptionist who will layout the information and presents it to the end-user.

Normally, the Greenstone software is setup using one Receptionist and one Collection Server running at the same computer. In this case the Receptionist

and Collection server form one component, called the *Library,* to which requests can be passed and from which responses are received. Clients can access the Library using the CGI mechanism. APPENDIX A – The CGI mechanism gives more details about the CGI mechanism.

Greenstone can also be implemented according the CORBA scheme. Using CORBA, the Receptionist and the Collection Server, or separate modules of these, can run on different servers, on different platforms, communicating with each other trough a network or Internet connection.

2. Database

The Greenstone software uses a database to store the digital documents that are placed in the library. GDBM (GNU DataBase Manager) is used as the database management program while MG (Managing Gigabytes) is used for searching and making the search indexes.
As the Greenstone Runtime System is relatively easy to modify, changing to another database system, like SQL, can be done with less effort.

3. Plugins

When building a collection, the documents to add are first parsed by a plugin. Plugins, written in the Perl language, are used to extract *metadata* (see next section) from the documents.
Different plugins are used to process different types of files. There Word plugins to process Microsoft Word documents, PDF plugins to process PDF files, image plugins to process images and so on. Documents containing text are converted to either HTML or Text format so that the contents of the document (text) can be indexed for searching.
After this, another plugin converts the document to the Greenstone Archive Format. The Greenstone Archive Format is an XML-style document that contains all of the information (in the form of metadata) and the contents of the imported document.

4. Metadata

Metadata gives information about a document in the digital library. Information like the Title of a document, the author, a description, they can all be stored in metadata to give more information about the document. Later on, the data stored as metadata can be used for searching, e.g. to search for a specific title, or to search for documents from one specific author. But the metadata is also used for displaying information about the document on the web-page interface. When an end-user browses trough the documents of the digital library some information about the documents, like title, a short description, author etc., is given. All of this information is stored in metadata.

Metadata for a document can be entered manually but, during the build process, metadata is also assigned to a document automatically. Normally, when a plugin

parses a document, metadata is extracted from the original document. E.g. when extracting a PDF document it is relatively easy to extract the title and the author of the document as these are normally both stored in a PDF document. The extracted metadata can be used later on for displaying information about the document, but as the extracted metadata is not very reliable (depends on the original file format of the document and the layout settings of the document) it is more trustworthy to use the manually entered metadata for this.

5. Macro language

The Greenstone software works with an own *macro language* which is used for lay outing HTML pages generated by the Greenstone Runtime System. The macro language can be seen as an abstraction above HTML. The language is similar to HTML but gives a developer more flexibility in customizing the layout of the user interface of a Greenstones collection. A macro is like a procedure or function of a common programming language but only with HTML code or references to other macros in the body of the procedure or function.

An example of a macro is given below.

```
1  _htmlhead_ [c=sasolinf] {
2  <html>
3    <head>
4    <title>SASOL Information Hub</title>
5    <link rel="stylesheet" href="_httpprefix_/collect/sasolinf/css/style.css"
6     type="text/css"/>
7     _globalscripts_
8    </head>
9    <body>
10 }
```

Code example 1. The _pagebanner_ macro

The example given in Code example 1 displays a macro which contains the first lines of HTML code of an HTML page. The first line in the example displays the macro name, which is `_htmlhead_` (macros always start and end with an underscore), followed by an argument. The argument, `[c=sasolinf]` specifies the collection (sasolinf) to which this macro belongs to. The body contains normal HTML code together with a call to another macro, called `_globalscripts_`, which contains some JavaScript.

The power of macros is that it gives a lot of flexibility in modifying the layout of a collection without accidentally modifying the layout of another collection. By specifying, with an argument, to which collection the macro belongs to, the HTML code is applied only to that collection. Alternative arguments can be given as well, like the language of the collection so that separate macros can be written for different languages, or an argument to specify that the macro only has to be

applied if viewed in text-only mode. Another advantage is that it minimizes the amount of code to work on when modifying the layout: a macro contains only a limited part of an HTML page (e.g. only a header, or a page content) and also by referring to other macros within a macro, large amount of code can be 'replaced' by only one macro name.

As one can expect, the macro language does not only have positive sides; a drawback of the macro language is that some of the macros are deeply coded inside the Greenstone Runtime System which makes it hard sometimes to modify the functionality of a specific macro. Most of the layout macros are coded in plain text files, very similar to HTML files, which are easy to modify. But not all of the macros are accessible as easy as those macros. Mainly the macros that have less or nothing to do with the layout (e.g. like the behavior of a hyperlink) are coded inside the Greenstone Runtime System or in one of the other scripts used for generating the HTML page, which makes modifying the macro only possible by modifying the source code which is less convenient than modifying a relatively small macro file.

Normally, a collection uses an own macro file in which its layout is specified. The macro file can be kept relatively small as only the Macro code of the modified part of the layout has to be placed in the file. The layout that has not being changed is specified in the default macro files shipped with the Greenstone software.

5.1. Packages

Packages are used for grouping macros with an equal role. The table displayed below gives an overview of the different packages together with their roles. The table is derived from the website of the Washington Research Library Consortium (http://www.wrlc.org/dcpc/UserInterface/interface.htm)

Package Name	File Name	Roles
package Global	base.dm english.dm	Contains macros that work for all display screens, if the [c=collection name] is not specified.
Package Style	style.dm	Controls the display style for all pages, if the [c=collection name] is not specified.
Package document	english.dm document.dm	Contains macros for the document display.
Package query	query.dm english.dm	Contains macros for the Search page display.
Package preferences	pref.dm english.dm	Contains macros for the Preferences page display.
Package help	help.dm english.dm	Contains macros for the Help page display.

Package about	about.dm english.dm	Contains macros for the About page display.
Package browse	browse.dm english.dm	Contains macros for the dynamic browsing interface.

Table 1. Overview of available packages

Packages are spread over multiple files. At first this might look confusing as looking up macros with an equal role may require multiple files to be searched, and sometimes it is a little bit confusing indeed. But a benefit of this structure is that only a small part of a package has to be placed in a file that belongs exclusively to one collection.
Chapter 11, The SASOL.dm macro file, describes this file, applied for the SASOL Information Hub.

6. Classifiers

Classifiers are used for generating collection's browsing indexes and are normally linked to a button on the navigation bar. For example, the SASOL Information Hub contains a button 'Categories'. The linked classifier is displayed below.

```
1  classify Hierarchy -metadata sf.Category -sort sf.Title -buttonname
2  "<img src=_httpprefix_/collect/sasolinf/images/categories.gif border=0
3  width=86 height=25 alt=Categories>" -documents_last
```

Code example 2. Classifier for generating category page

A classifier specifies what the browsing index should contain and how to display the index.
The classifier shown in Code example 2 is specified to create a hierarchical list ('Hierarchy' represents one of the available classifier objects, described later), of which the hierarchy nodes (categories and subcategories) are named using the sf.Category metadata tag of a document; e.g. when for a specific document the value 'ICT' is filled for the sf.Category metatag, the category ICT will be created in the category overview.
Furthermore, it is indicated that the list's leaf nodes (the actual documents) are sorted on document title, the assigned button name refers to some HTML code that displays a GIF image. The last classifier options specifies that first the category nodes are displayed and then the leaf nodes (documents).

Classifiers can be specified in the collection's configuration file, but normally it is done using the Greenstone Librarian Interface.

6.1. Classifier objects

Classifiers make use of classifier objects. In Code example 2, 'Hierarchy' is the used classifier object. Other classifiers objects are available, e.g. the AZList for creating Alphabetic ordered lists, DataList for creating lists ordered on datefor creating Alphabetic lists (AZList) etc. A classifier object is written in the Perl language and executed at the time a collection is being build.

7. Format strings

Format strings are used for formatting browsing indexes produces by classifiers and search queries. Although Greenstone's macro language syntax is used for formatting, format strings are not part of the Macro file, but are, just like classifiers, part of the collection's configuration file.

An example of a format string is given in the code example below. The format string is used for formatting the output of a search query which is a list of documents. More details about format strings can be found in chapter 10.4.5, Format Features

```
1  format SearchVList
2  "<hr>
3    <table width=\"100%\">
4      <tr><td width=\"10%\" valign=\"top\"><b>Title: </b></td><td
5        width=\"90%\">[sf.Title]</td></tr>
6      <tr><td valign=\"top\"><b>Description:
7        </b></td><td>[sf.Description]</td></tr>
8      <tr><td valign=\"top\"><b>Category:
9        </b></td><td>[sf.Category]</td></tr><br>
10     <tr><td> </td><td align=\"left\">[ex.srclink][ex.srcicon]View
11       document [ex./srclink]</td></tr>
12   </table>"
```

Code example 3. Format string for formatting the search results list.

Part 2 – Advanced maintenance of the Information Hub

8. Introduction

Maintaining the SASOL Information Hub is mainly done using the Greenstone Librarian Interface and by modifying the SASOL.dm macro file and the Information Hub style sheet (style.css). The Librarian Interface is used for modifying the functionality of the Information Hub and doing some small adjustments on the layout (by modifying Format strings). The SASOL.dm macro file and the style sheet are used for modifying the layout.

9. Directory structure

This chapter describes the directories that are important to know about when maintaining the Information Hub.

First, two variables will be defined here which will be used throughout this chapter: one to refer to the Greenstone home directory and the other one refers to the home directory of the SASOL Information Hub collection:

`GREENSTONE_HOME`	→	Greenstone root directory (where Greenstone software has been installed)
`COLLECTION_HOME`	→	GREENSTONE_HOME/collect/sasolinf

The major directories are listed below:

Directory	**Contents**
`GREENSTONE_HOME/collect`	installed collections
`GREENSTONE_HOME/etc`	Greenstone configuration file
`GREENSTONE_HOME/images`	default images and style sheets
`GREENSTONE_HOME/macros`	macro files
`GREENSTONE_HOME/perllib`	perl scripts (plugins, classifier objects)
`COLLECTION_HOME/archives`	the actual documents in the library
`COLLECTION_HOME/css`	collection style sheet
`COLLECTION_HOME/etc`	collection configuration file
`COLLECTION_HOME/images`	collection images
`COLLECTION_HOME/import`	imported documents

10. Greenstone Librarian Interface

The Greenstone Librarian Interface can be started by either clicking the Greenstone Librarian Interface icon on the desktop or by pressing Start → Programs → Greenstone Digital Library Software → Greenstone Librarian Interface.

Depending on the mode the Greenstone Librarian Interface is running in, it is possible that not all of the functionality of the application is available. To make sure that all of the functionality is available, the application has to be in 'Expert mode', which can be set using preferences menu, accessible by pointing File → Preferences…

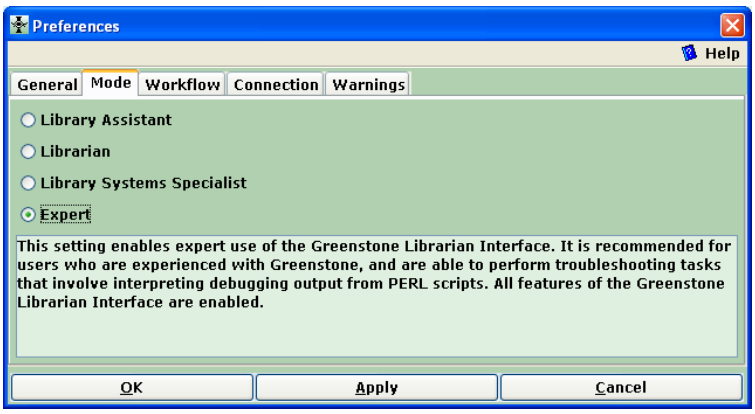
Preferences
Help
General
Mode
Workflow
Connection
Warnings
Library Assistant
Librarian
Library Systems Specialist
Expert
This setting enables expert use of the Greenstone Librarian Interface. It is recommended for users who are experienced with Greenstone, and are able to perform troubleshooting tasks that involve interpreting debugging output from PERL scripts. All features of the Greenstone Librarian Interface are enabled.
OK
Apply
Cancel

Figure 32. Application mode is set to 'Expert'

Before working on the SASOL Information Hub, make sure that the right collection is opened. If the Information Hub collection is opened, the title bar of the Librarian Interface should contain: 'Collection: SASOL Information Hub (sasolinf)'.
If the Information Hub collection is not yet opened it can be done by pointing File → Open… The Information Hub collection can be opened in the next appearing window.

The Greenstone Librarian Interface application contains five different panels:

- Download panel
- Gather panel
- Enrich panel
- Design panel
- Create panel

10.1. Download panel

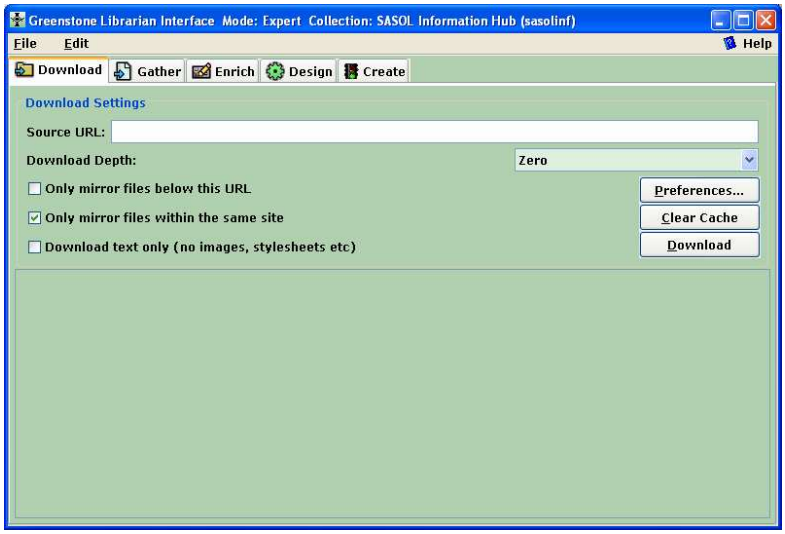

Figure 33. Download panel

The Download panel is used for downloading resources from the Internet. An Internet connection is currently not available at the SASOL office. Therefore, this panel has no sense to be used while maintaining the Information Hub.

10.2. Gather panel

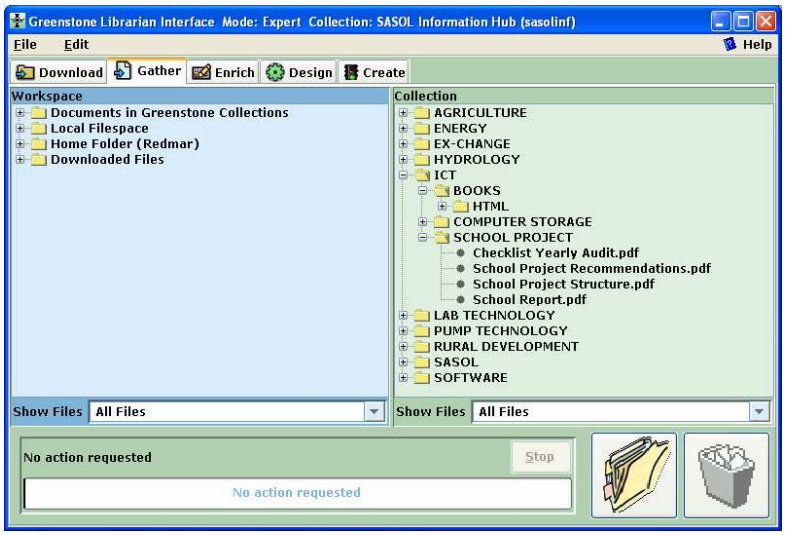

Figure 34. Gather panel

The Workspace structure on the left and the Collection structure on the right are the major parts of the Gather panel, in which the files for the collection can be collected.

The Workspace structure displays the contents of the local computer; the Collection structure displays the contents of the Information Hub. A file can be dragged from the Workspace structure to the Collection structure to copy it to the

Information Hub. As can be seen in Figure 34, the folder structure of the Collection structure corresponds with the category structure of the Information Hub. In reality, this folder structure has nothing to do with the category structure at all, but it is very important that both structures are equivalent as this makes the retrieval of documents much easier afterwards.
However, it is possible that a file is assigned more than one category. In this case, the file should be placed in the folder corresponding with the main category of the file, which is the first 'sf.Category' metatag, as described in the next section about the Enrich panel'. Files displayed at the 'Title page' of the Information Hub do always display the category that the documents belong to. When a file belongs to multiple categories, only the main category will be shown.

New folders can be created in the Collection by clicking with the right mouse button in the Collection structure. When clicking an empty area in the Collection structure a new root folder can be created. A new subfolder can be created by clicking the parent folder with the right mouse button.
Deleting a file or folder can be done by clicking the file/folder with the right mouse button and then choose Delete.

10.3. Enrich panel

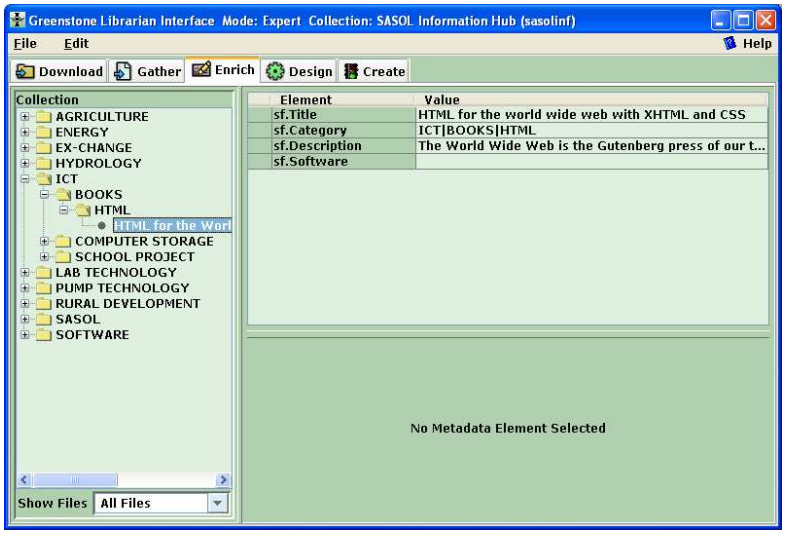

Figure 35. Enrich panel

The Enrich panel is used to fill the metadata for a specific file. To fill the metadata, first a file has to be selected from the Collection structure on the left side of the panel, the metadata can then be filled in the area on the right side of the panel. The metadata elements sf.Title and sf.Description are displayable metadata elements; the values for these elements are displayed to the end-user when he or she browses trough the contents of the Information Hub.

The metadata element sf.Category is used to specify the category the file belongs to. As can been seen in Figure 35, the category corresponds to the

location of the file in the Collection structure. The '|' symbol (vertical line) is used to separate a parent category from a child category.

The last metadata element, sf.Software, is used to indicate that the file is not an informative document, but a software application. For informative documents, this metadata element should be kept empty, but for a Software application, this element should be filled with the character 'Y' (from yes). A software application will be added to the 'Software page' of the Information Hub.

10.4. Design panel

The functionality and part of the layout of the SASOL Information Hub can be customized using the Design panel. The left side of the panel contains the different sections for which customizations can be made. For the SASOL Information Hub, not all of these sections are, or need to be, customized. Therefore, only the sections which are relevant to the SASOL Information Hub will be discussed, which are:

- General
- Document Plugins
- Search Indexes
- Browsing Classifiers
- Format Features
- Metadata Sets

Most of the settings of the Design panel are stored in the collection's configuration file:

```
COLLECTION_HOME/etc/collect.cfg
```

10.4.1. General

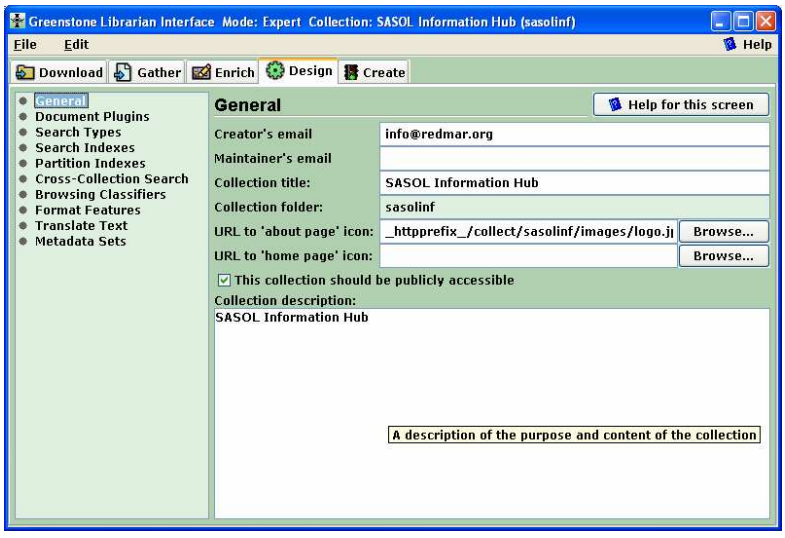

Figure 36. Design panel (General)

Under general, some information about the Information Hub collection can be given. The logo which is used for the SASOL Information Hub (displayed at the top of each page of the web interface) is displayed here as well.

10.4.2. Document Plugins

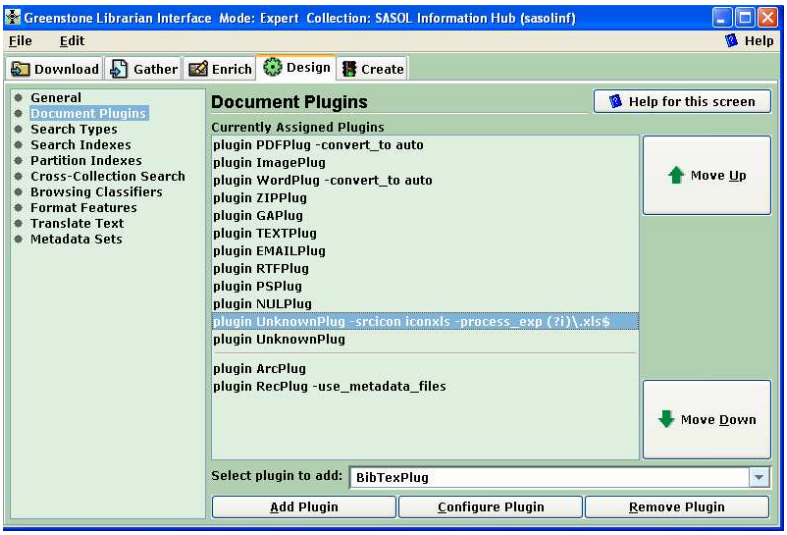

Figure 37. Design panel (Document Plugins)

Document Plugins specifies the plugins that are used by the Information Hub collection for importing documents. The order of the plugin list is important as the import process traverses from top to bottom trough the plugin list and the first suitable plugin will be used for the document to be imported.
The UnknownPlug is listed as last in the plugin list. If no suitable plugin could be found for an imported document, it will be imported as an unknown file. No information will be extracted from an unknown file during the import process. This means that textual content will not be taken for indexing.

A plugin can be configured by selecting the plugin and then pressing the Configure Plugin button.

Important note
Although an Excel plugin exists, all Excel documents are imported using an UnknownPlug plugin, configured in such a way that the documents are assigned an Excel icon. The reason that the Excel plugin is not used is that there seems to be a problem with this plugin; some Excel documents are not imported properly with this plugin and are consequently not added to the collection at all. Another UnknownPlug plugin can be found in the list, which is used for any other file for which a plugin could not be found.

More 'specific' UnknownPlug plugins can be added to the list. Unfortunately, the Librarian Interface doesn't support the addition of multiple UnknownPlug plugins. Therefore, it has to be done manually by editing the Information Hub collection configuration file (`COLLECTION_HOME/etc/collect.cfg`)

10.4.3. Search Indexes

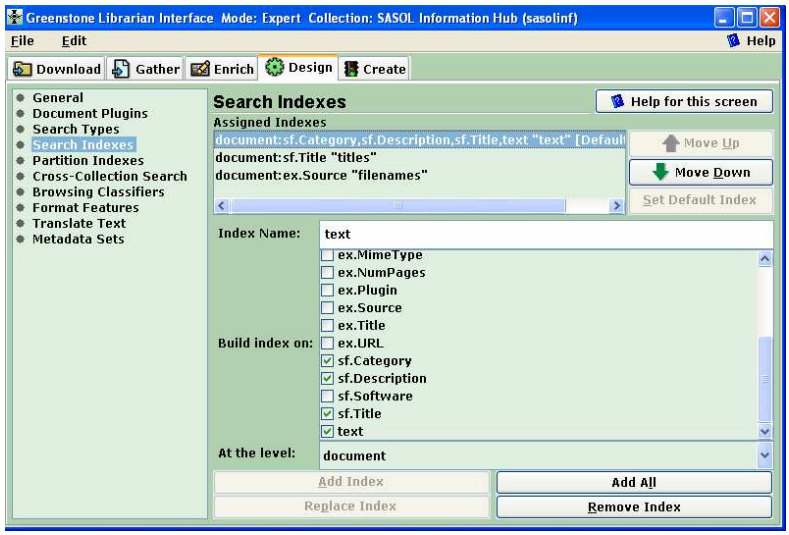

Figure 38. Design panel (Search Indexes)

The behavior of the collection's search module can be set under Search Indexes. Three indexes are specified for the SASOL Information Hub, which correspond with the three 'Search for' options of the dropdown box that an end-user can choose from on the Advanced search page.

The first index (also the Default Index), displayed in the Assigned Indexes area is specified to index the contents of the metatags sf.Category, sf.Description and sf.Title and the contents of the document (text). This index is used when a search is made from the Homepage of the Information Hub web interface or when the end-user chooses the search for text option by choosing 'text'(= Index Name) from the dropdown menu on the Advanced search page.

Two other search indexes are available for the Information Hub: ‘titles’, which can be used for searching trough the document titles of the Information Hub and ‘filenames’, to search trough the original filenames of the documents.

All of the indexes are built at ‘document level’. As the SASOL Information Hub does not contain any HTML documents (only external files, like PDF, JPG, Excel etc.) the index level is not important. Collections containing HTML documents can use this feature to create indexes for the separate sections or paragraphs of a document, so that a search result can further specify which part of the document contains the searched keyword.

10.4.4. Browsing Classifiers

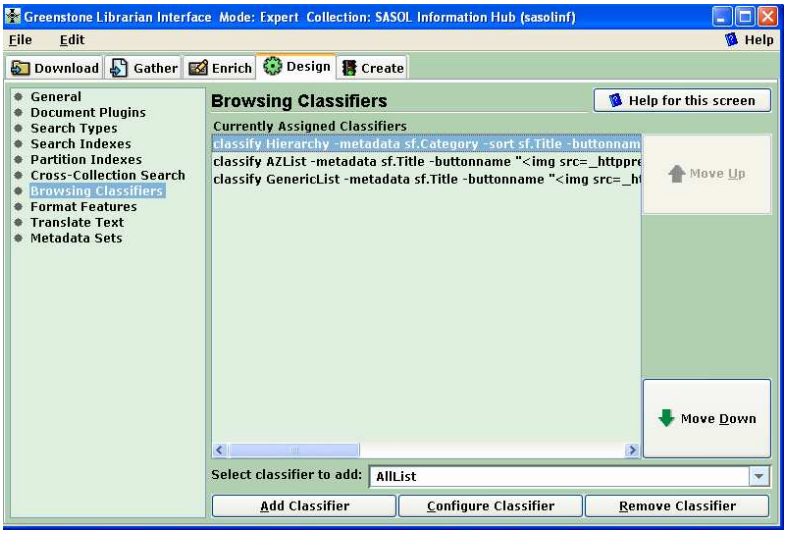

Figure 39. Design panel (Browsing Classifiers)

Classifiers are specified under the Browsing Classifiers section of the Design panel.
The SASOL Information Hub uses three classifiers, which are linked to the buttons Categories, Titles and Software on the navigation bar of the Information Hub web interface.
The first classifier in the lists specifies the classifier linked to the Categories button. The different parts of this classifier are already explained in chapter 6, Classifiers: create a hierarchical list on metatag sf.Category, sort on title, use the specified image as button image, and show the leaf nodes after the category nodes.
The second (Titles) and third (Software) classifier work in a similar way. A difference is that the second classifer uses an AZList for generating an alphabetic list of the titles (using the sf.Title metatag), the third classifier uses a GenericList, which is just a plain list titles.

There are some more classifier types with different functionality to choose from the dropdown list at the bottom of the panel.

10.4.5. Format Features

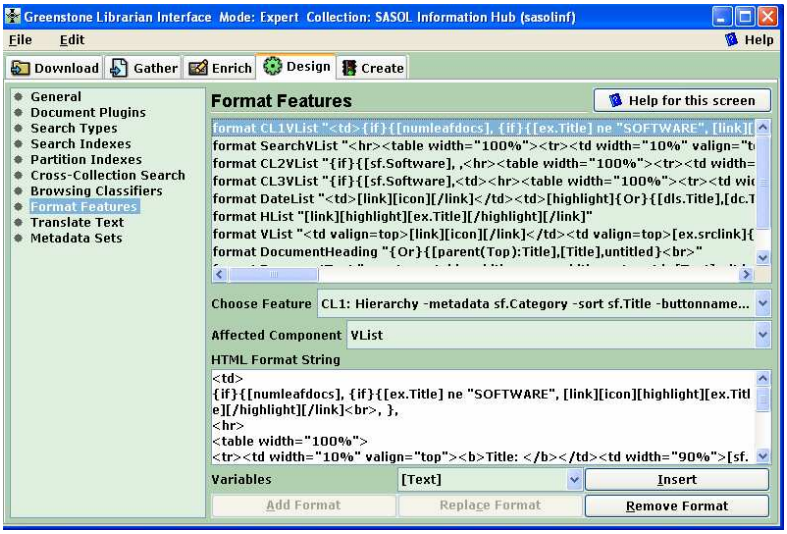

Figure 40. Design panel (Format Features)

The layout of the classifier output and the search results lists can be customized under the Format Features section. A large list of format strings is found under this section, but only five are used for the SASOL Information Hub: 'format CL1VList' … 'Format CL3VList', 'format SearchVList' and 'format HList'. The three 'Format CLxVList' are referring to the classifiers from the Browsing Classifiers section. 'Format CL1VList' contains the formatting used for the first classifier in the list; 'Format CL2Vlist' contains the formatting for the second classifier and so on. 'format SearchVList' contains the formatting of the search results lists on the search page and 'format HList' is responsible for formatting the alphabet on top of the Titles page.
An HList always represents a horizontal list whereas a VList represents a vertical list.

The format string 'format CL1VList' is the most complex format string, so let's take a look at the details of this one.
When the format string is selected, it can be seen that the selected value in the Choose Feature dropdown box is referring to the first classifier (CL1) and that the selected value in the Affected Component dropdown box contains the value 'VList'. These two values together form the 'CL1VList' part of the Format string. Below the two dropdown boxes, the associated HTML code (mixed with format statements) can be found. The code in this textbox is editable code. The code for this classifier is displayed in the code example below.

```
1  <td>
2   {if}{[numleafdocs],
3    {if}{[ex.Title] ne "SOFTWARE",
4      [link][icon][highlight][ex.Title][/highlight][/link]<br>, },
5
6    <hr>
7    <table width="100%">
8      <tr><td width="10%" valign="top"><b>Title: </b></td><td
9        width="90%">[sf.Title]</td></tr>
10     <tr><td valign="top"><b>Description:
11       </b></td><td>[sf.Description]</td></tr>
12     <tr><td> </td><td align="left">[ex.srclink][ex.srcicon] View
13       document [ex./srclink]</td></tr>
14   </table>
15  }
16 </td>
```

Code example 4. Format string belonging to 'format CL1VList' classifier

The way this format string is applied on the classifier output may be a little bit abstract at first, but what actually happens is as follows:

The classifier is specified to generate a Hierarchy, this means that the classifier will generate a list containing both nodes and leafs (categories and documents in our case). Initially, all the categories of the Hierarchy are collapsed, so a list with closed categories will be formatted by the format string. The format string displayed in Code example 4 will be applied to all of the categories, so in fact the code in the format string runs within a loop. As soon as an end-user opens a category by clicking on it, the Hierarchy list will be generated again, now with one of the categories expanded and showing the contents of it, which can contain both subcategories and documents. The list will be formatted again by the format string and is applied again on every subcategory and/or document.

Now, let's take a closer look at the different parts of the format string. The first line of the code, `<td>` is used for generating a new table cell. The complete list is generated within a table, so every category and document displayed will be formatted within a cell.
What follows next is an IF-statement. The syntax of an IF-statement within a format string is as follows:

{if}{condition, code to execute when true, code to execute when false}

The IF-statement in this format string uses the format statement `[numleafdocs]` as condition to check if the passed list component is either an internal node (category) or a leaf (document). When the list component is an internal node, TRUE is returned and the title of the category has to be displayed. Otherwise,

when the component is a leaf, the condition returns with FALSE and the title with some accompanied information has to be displayed.
The code for displaying the category starts at line 3, with another IF-statement. This second IF-statement checks if title of the category is not equel (ne) to "SOFTWARE". If so, the category title is displayed, otherwise nothing about this category is displayed.
Displaying the category title happens on line 4. Some format statements are given used in this line:

`[link]...[/link]`	represents a URL. Everything between belongs to the URL.
`[icon]`	in this case, the category icon (the blue dot).
`[highlight]...[/highlight]`	everything in between will be displayed in bold, when this category is active (pressed by the end-user).

The metadata element `[ex.Title]` is found in between these statements. This metadata element represents the title of the category. Finally a line brake `<br>` is given so that the next category is displayed on a new line.
No statements are given if the condition returns FALSE, as nothing has to be displayed in this case.

Line 6 continues with the code when [numleafdocs] condition, in line 2 had returned with FALSE, thus when the component to be formatted is a leaf (or document in our case).
The code contains some basic HTML statements, which are not all described here, as this is outside the scope of the document. The basic idea is that a table is created in which the information about the document is displayed. The title `[sf.Title]`, a description about the document `[sf.Description]` and a link (icon and text) to open the document `[ex.srclink][ex.srcicon] View document [ex./srclink]` are the main parts of the table. Finally the first IF-statement is closed with a curly bracket and the cell, opened on line 1 is closed again on line 16 (`</td>`).

Extra Addition
In Code example 4, it can be seen that the title of a category is displayed using the metadata element `[ex.Title]`. The classifier, responsible for the creation of the category structure, determines the category titles using the `[sf.Category]` metadata elements specified for the documents of the Information Hub collection. So, the `[sf.Category]` metadata element should not be confused with the generated `[ex.Title]` metadata element used for the category title.

The format strings used for the remaining classifiers, the SearchVList and the HList are formatted in a way very similar to the format string as described above and are therefore the details are omitted in this document.

To add a new format string to the format features list, or a feature, or an affected component, or both options have to be chosen after which the button Add Format can be chosen. When the feature or affected component or the combination is already added the button stays disabled.
When editing the code of a format string, the changes can be saved by pressing the Replace Format button. The remaining two buttons are used for removing a selected format string from the list (Remove Format) and inserting a format string variable, which can be selected from the Variables dropdown box.

10.4.6. Metadata Sets

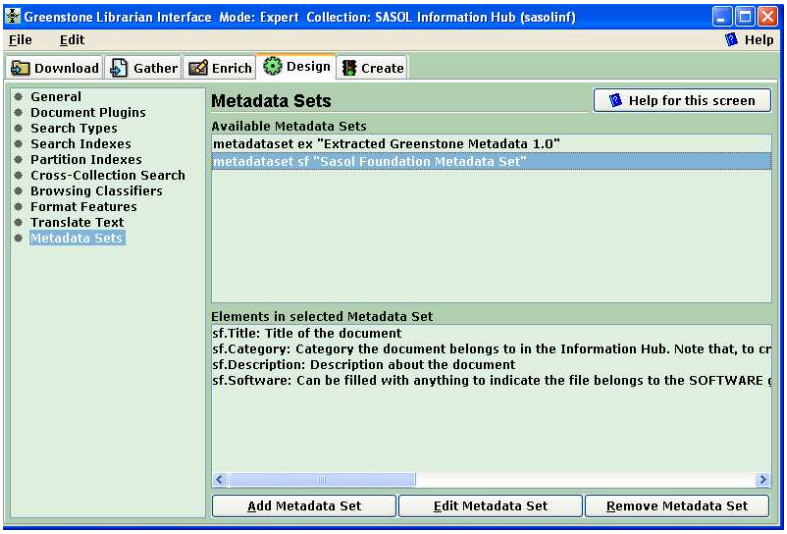

Figure 41. Design panel (Metadata Sets)

The last section, Metadata Sets, is rarely used as most of the modifications related to metadata sets is done using the Greenstone Editor for Metadata Sets. The only thing left that can be done here is the addition or removal of a metadata set, which is rare as the collection will normally always use the same set.

10.5. Create panel

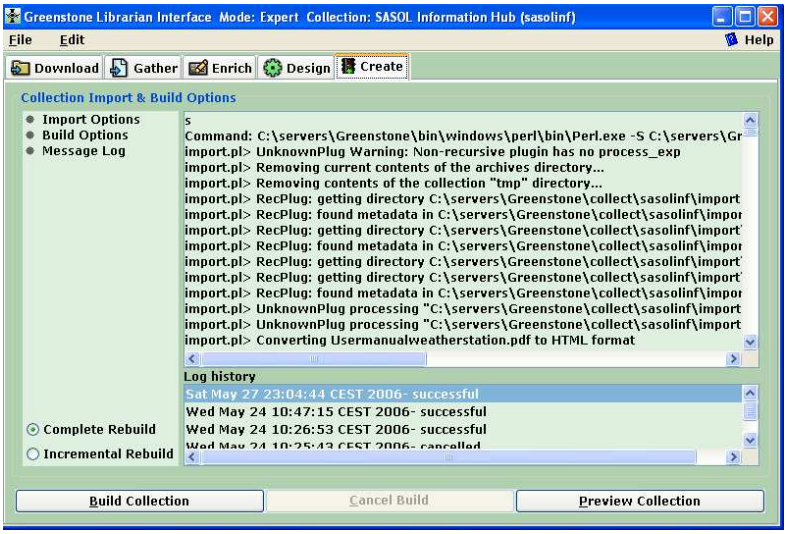

Figure 42. Create panel

The create panel is normally only used for building the SASOL Information Hub collection; nothing special has to be done here. By pressing the Build Collection button, the collection is going to be built. The build process can take a very long time; the larger the collection, the longer the build process takes but during the build process the Information Hub is still accessible.

11. The SASOL.dm macro file

The SASOL.dm macro file is responsible for the layout of the different components of the Information Hub web interface. This chapter will describe the different macros that can be found in this file (see chapter 5, Macro language for an explanation about the syntax of the macro language). It is possible that the macros found in the most recent SASOL.dm file do not entirely correspond anymore with the macros described in this chapter, or that new macro's are added to this file. The macros are documented in the SASOL.dm file itself as well, so for the most up-to-date documentation it is the best to refer to the SASOL.dm file itself.
The SASOL.dm macro file can be found under the '/macros' directory of the Greenstone home directory: GREENSTONE_HOME/macros.

Three packages (see chapter 5.1, Packages) can be found in the SASOL.dm file:

- Package Global
- Package Style
- Package About

The packages will be described in the next sections. Note that, for keeping the code clear, the source documentation is not being displayed in the code

examples shown in these sections. The complete source code, included with documentation can be found in APPENDIX B – SASOL.dm macro file.

All of the macros in the SASOL.dm macro file are using the argument c=sasolinf to indicate that the macro is specifically for the SASOL Information Hub collection.

11.1. Package Global

```
1   package Global
2
3   _pagewidth_ [c=sasolinf] {100%}
4
5   _httpiconbshelf_ [c=sasolinf] {_httpprefix_/collect/sasolinf/images/dot.gif}
6   _httpiconless_ [c=sasolinf]{_httpprefix_/collect/sasolinf/images/previous.jpg}
7   _httpiconmore_ [c=sasolinf] {_httpprefix_/collect/sasolinf/images/next.jpg}
8
9   _labelSearch_ [c=sasolinf] {
10    <img src=_httpprefix_/collect/sasolinf/images/search.gif border=0 width=86
11    height=25 alt=Search>
12  }
```

Code example 5. Package Global

In the code example above, the package starts with an identification of its package name at line 1: package Global.

The statement on line 3 simply sets the page width on 100%, so that the web interface is spread over the full width of the screen.
Line 5, 6 and 7 define some new icons: an icon to be displayed in the hierarchical category structure ( ) to indicate a category node and two navigation buttons (and) to display the previous and next list of documents, when a (sub)category contains more than 20 documents or more than 20 documents are found for a search result.

The macro _labelSearch_ on line 9 defines the image used for the Search button on the navigation bar.

11.2. Package Style

```
1   package Style
2
3   _htmlhead_ [c=sasolinf] {
4   <html>
5     <head>
6     <title>SASOL Information Hub</title>
7     <link rel="stylesheet" href="_httpprefix_/collect/sasolinf/css/style.css"
8       type="text/css"/>
9      _globalscripts_
10    </head>
11    <body>
12  }
13
14  _optnavigationbar_ [c=sasolinf] {}
15
16  _pagebanner_ [c=sasolinf] {
17    <center>
18    <table width=_pagewidth_ cellspacing=0 cellpadding=0 border=0>
19      <tr>
20       <td background="_httpprefix_/collect/sasolinf/images/padding.jpg"
21          valign=top colspan=3 align=left border=0>_imagecollection_
22       </td>
23      </tr>
24      <tr class="linerow">
25        <td class="navigationlinks" colspan=3 align=center border=0>
26          <span class="navlink"><a href="_httppageabout_"><img
27          src="_httpprefix_/collect/sasolinf/images/home.gif" border=0 width=86
28          height=25 alt="Home"</a>
29          </span><span style="margin-left: 2px;"></span>_navigationbar_
30        </td>
31      </tr>
32
33    </table>
34    </center>
35  }
```

Code example 6. Package Style

Again, the code starts with identifying the package name on line 1: package Style. The _htmlhead_ macro on line 3 is used to specify the header of the HTML files used for the web interface. Things like the Title of the page, references to external style sheets but also some Javascripts can be specified here.

On line 14, an empty macro can be found. This macro, _optnavigationbar_ is overridden empty to prevent that the navigation bar is displayed on the default location. Instead of referring to this macro, the macro _navigationbar_ has to be used at the location were the navigation bar is to be displayed. In the code example above, the _navigationbar_ macro is referred at line 29, in the body of the _pagebanner_ macro. This macro is responsible for generating the page header (logo and navigation bar), as displayed in Figure 43. The logo is displayed by calling by the _imagecollection_ macro.
As can bee seen in the code, the home button is not being generated by the _navigationbar_ macro but inserted by hand.

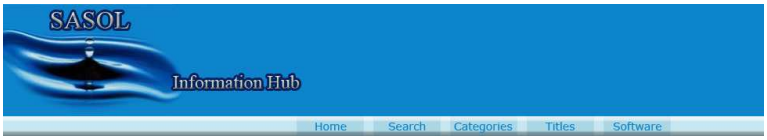

Figure 43. Page header of the Information Hub

11.3. Package About

Package about (Code example 7), starting with the identification package about on line 1, contains the macro code for the about page which, in the case of the Information Hub, is used for the Home page.
The macro starting on line 3, _aboutqueryform_, represents the Search form on the upper part of the Home page.
Some input types are given for this Search form. These input types are used as CGI arguments for the Greenstone Runtime System, running server-side. The exact meaning of the arguments can be found on the Greenstone Administration page, accessible by entering the root of the local host (http://127.0.0.1/), then choose Administration Page, then arguments (under Technical information). The same table with arguments can also be found at APPENDIX C – Greenstone argument information.

Next, on line 26, the _content_ macro is found which does nothing more than invoking the _aboutqueryform_ macro, described earlier, and the _textabout_ macro defined at line 31, containing a textual description that is displayed at the home page.

```
1   package about
2
3   _aboutqueryform_ [c=sasolinf] {
4     <form name=QueryForm method=get action="_gwcgi_">
5     <p>
6     <input type=hidden name="a" value="q">
7     <input type=hidden name="r" value="1">
8     <input type=hidden name="hs" value="1">
9
10    <input type=hidden name="h" value="dss">
11    <input type=hidden name="t" value="1">
12    <input type=hidden name="e" value="_decodedcompressedoptions_">
13    <table cellspacing="0">
14    <tr>
15      <td>Search now: </td>
16      <td><input type="text" name="q" value="" size="50"><input type="submit"
17        value="Search"></td>
18      <td align="right">  <a href=_httpquery_>Advanced search</a></td>
19    </tr>
20
21    </table>
22    </p>
23    </form>
24    }
25
26  _content_ [c=sasolinf] {
27    _aboutqueryform_
28    <p>_textabout_</p>
29  }
30
31  _textabout_ [c=sasolinf] {
32    <div class="section">
```

```
33    <h3>Welcome to the SASOL Information Hub</h3>
34    <table width=700>
35    <td><tr>
36    <p>You have just opened the SASOL Information Hub. The Information Hub is a
37    digital library system on which you can find all kinds of information in a
38    quick and simple way.</p>
39    <p>Above here you can type a search query or you can click on 'Advanced
40    search' to search more specific. It is also possible to browse through the
41    categories and subcategories of the Information Hub. To do this, you have to
42    click on the 'Category' button in the navigation bar above.</p>
43    <p>If you have information, digital or physic, that is suitable for the
44    Information Hub, you can inform the ICT team. They can place the information
45    on the SASOL Information Hub. It is of great meaning to extend and improve
46    the information on the Information Hub. All information is welcome, and you
47    can help to make the Information Hub a success!</p>
48    </tr></td>
49    </table>
50    </div>
51  }
```

Code example 7. Package About

11.4. Further learning

The Greenstone Macro language can be a bit painful to learn at first, especially due the fact that less information about the available macros can be found in the Greenstone documentation. The best way to get used with the macro language is by looking through the already available macro files. There is one macro file available with very comprehensive documentation and explanations about its structure. The file, named Garish.dm, can be found under the same directory as the SASOL.dm macro file: GREENSTONE_HOME/macros.

12. Information Hub Style sheet

```
1   body {
2     font-family: Verdana, Arial, Helvetica, sans-serif;
3     background-color: #FFFFFF;
4     color: #000099;
5     scrollbar-face-color: #C9E7F2;
6     scrollbar-arrow-color: #000099;
7   }
8
9   h1, h2, h3, h4 {
10   font-family: sans-serif, arial, helvetica;
11   color: green;
12  }
13
14  a:link {
15        text-decoration: none;
16        color: #0033FF
17  }
18
19  a:visited {
20        text-decoration: none;
21        color: #0033FF
22  }
23
24  .linerow {
25        background-image: url("/collect/sasolinf/images/line.jpg");
26        height: 25px;
27        border: 0px;
28        padding: 0px;
29  }
30
31  img.icon { border: 0; }
32
33  span.navlink {
34        height: 25px;
35        padding: 0px 10px 0px 0px;
36        border: 0px;
37  }
38
39  span.navlink_sel {
40        height: 25px;
41        padding: 0px 10px 0px 0px;
42        border: 0px;
43  }
```

Code example 8. Information Hub Stylesheet

A small style sheet is used for the SASOL Information Hub. The style sheet, named ‘style.css’ and found under the ‘/css’ file of the collection’s homedirectory (`COLLECTION_HOME/css`), is being referred from the SASOL.dm macro file. The next section will briefly describe the different parts of the style sheet.

Line 1 starts with a style where the layout of the <body> element is defined; font-type, background color, font-color and a different scrollbar are defined here.

Next, at line 9, the Header style is defined; the font-type and font-color are set here. Currently, only the ‘Welcome to…’ title at the Home page makes use of this style.

At line 14 to line 22, styles about hyperlinks are defined. Hyperlinks are mainly used in the category structure. No underline is displayed for hyperlinks and the colors for non visited and visited hyperlinks are the same.

The linerow style, at line 24, represents the row in which the navigation bar is positioned. A background image for this row is set, together with some general row settings.

Line 31 disables borders around images.

Styles for the navigation bar itself are set in the styles from row 33 to 43. Actually, two different styles are defined for the navigation bar. The first style is applied on a button in the navigation bar which is not active (not pressed) and the second style is applied on a button in the navigation bar which is active (pressed). For the SASOL Information Hub, both styles are exactly the same, so there is now difference between a pressed and a non pressed button.

12.1. Further learning

The default style sheet shipped with the Greenstone software, named 'style.css' and found under `GREENSTONE_HOME/images` contains much more styles that can potentially be applied to the SASOL Information Hub.

13. Metadata set

A new metadata set is created for the Information Hub, called the 'SASOL Foundation Metadata Set'.
The metadata set contains the following metatags:

Title	represents the title of the document
Category	Indicates to which category (e.g. water, energy, ict etc.) the document belongs to
Description	a description about the document
Software	Set if the document (or better said file) is not an informative document but an application instead

14. Plugin modifications

A few minor changes to some plugins (Perl scripts) have been made. The changes apply on the way how documents are opened within the Information Hub. The plugins to which the changes have been made are used for importing documents to the Information Hub. One of the responsibilities of these plugins is to generate a hyperlink to the documents. By default, these hyperlinks were generated in such a way that the documents are opened in the same browser window as that of the Information Hub. The documents that can be found on the Information Hub are opened using an external application (e.g. Acrobat Reader) and most of the users close the opened documents by pressing the window close

button, thus closing the Information Hub window at the same time. The modifications to the plugins change the generated hyperlink type to one that will open the documents in a new browser window.

The change to the plugins are described below. The plugin Perl scripts can be found under the directory `GREENSTONE_HOME/perllib/plugins`.

ConvertToPlug.pm

Line number: 457

Old code:

```
my $doclink =
"<a href=\"_httpcollection_/index/assoc/[archivedir]/doc.$doc_ext\">";
```

New code:

```
my $doclink =
"<a href=\"_httpcollection_/index/assoc/[archivedir]/doc.$doc_ext\"
target=\"_blank\">";
```

Reason for change:
To open documents in a new browser window.

ImagePlug.pm

Line number: 201

Old code:

```
$doc_obj->add_metadata
  ($section, "srclink",
  "<a href=\"_httpcollection_/index/assoc/[assocfilepath]/[Image]\">");
```

New code:

```
$doc_obj->add_metadata
  ($section, "srclink",
  "<a href=\"_httpcollection_/index/assoc/[assocfilepath]/[Image]\"
  target=\"_blank\">");
```

Reason for change:
To open images in a new browser window (this code is not used yet, as ImageMagic is not yet installed and images are handled as Unknown files. May be changed back later on).

UnknownPlug.pm

Line number: 153

Old code:

```
$doc_obj->add_metadata ($section, "srclink",
  "<a href=\"_httpcollection_/index/assoc/[assocfilepath]/[$assoc_field]\">");
```

New code:

```
$doc_obj->add_metadata ($section, "srclink",
  "<a href=\"_httpcollection_/index/assoc/[assocfilepath]/[$assoc_field]\"
  target=\"_blank\">");
```

Reason for change:

To open unknown files in a new browser window. For downloadable files, like executables, opening in a new window doesn't matter, but e.g. for unknown image formats it does

APPENDIX A – The CGI mechanism

The CGI (Comman Gateway Interface) mechanism is used for the creation of dynamic generated web pages. The idea is similar to what languages like PHP and ASP and JSP do but the concept is different; CGI is not a programming language but just a protocol for interfacing external (binary) applications to a webserver. Clients can request the execution of the application by including the filename of the external application in the URL of the website. Optionally, arguments can be passed with the URL for interactivity with the external application.
As soon as the request arrives at the webserver the external application is located and executed. The output of the application's execution (STDOUT) is sent to the webserver who will pass it to the requested client on his turn.

A difference of CGI with languages like PHP, ASP etc. is that, using CGI, the application is completely separated from the webserver. Using CGI, the external application is often written in a language like C or PERL, but for example a language like PHP is just a programming language on itself and the language interpreter is normally integrated in the webserver.

It is said that the CGI mechanism can be a little bit tricky sometimes as for every client request a new process has to be started. As a lot of overhead is required for starting and stopping the external application it is possible to overload the server as a lot of client requests are made at the same time. Partly this is true, especially when using interpreted languages, like Perl, as a lot of overhead is needed for starting the external interpreters and consequently for the interpreting of the program scripts itself. But, when using a compiled language, like C, things are safer, as the overhead that is needed for starting and stopping the external application is minimal.

APPENDIX B – SASOL.dm macro file

```
##############################################################################
package Global
##############################################################################
_pagewidth_ [c=sasolinf] {100%}

## iconbshelf = icon used for displaying categories, iconmore = icon used for
## displaying the next 20 documents in document overview, iconless = icon used
## for displaying previous 20 documents.
_httpiconbshelf_ [c=sasolinf] {_httpprefix_/collect/sasolinf/images/dot.gif}
_httpiconmore_ [c=sasolinf] {_httpprefix_/collect/sasolinf/images/next.jpg}
_httpiconless_ [c=sasolinf] {_httpprefix_/collect/sasolinf/images/previous.jpg}

## Search button in the navigationbar
_labelSearch_ [c=sasolinf] {<img
src=_httpprefix_/collect/sasolinf/images/search.gif border=0 width=86 height=25
alt=Search>}

##############################################################################
package Style
##############################################################################

## htmlhead is used by the default _header_ macros. It prints out the
## beginning of an html file, including the header. We can override it here
## so that all pages will use our custom style sheet. Includes some javascript
## functions for rollover of images.
_htmlhead_ [c=sasolinf] {
<html>
  <head>
  <title>SASOL Information Hub</title>
  <link rel="stylesheet" href="_httpprefix_/collect/sasolinf/css/style.css"
        type="text/css"/>
   _globalscripts_
  </head>
  <body>
}

## Overriden empty to prevent the navigation bar to be displayed on the standard
## location. _navigationbar_ has to be specified instead on the location where
## the navigation bar has to be placed.
_optnavigationbar_ [c=sasolinf] {}


## The pagebanner specifies the logo of the Information Hub (_imagecollection_)
## and the contents of the navigation bar
_pagebanner_ [c=sasolinf] {
  <center>
  <table width=_pagewidth_ cellspacing=0 cellpadding=0 border=0>
  <tr>
    <td background="_httpprefix_/collect/sasolinf/images/padding.jpg" valign=top
      colspan=3 align=left border=0>_imagecollection_</td>
  </tr>

  <tr class="linerow">
    <td class="navigationlinks" colspan=3 align=center border=0>
    <span class="navlink"><a href="_httppageabout_"><img
      src="_httpprefix_/collect/sasolinf/images/home.gif" border=0 width=86
      height=25 alt="Home"</a>
    </span><span style="margin-left: 2px;"></span>_navigationbar_</td>
  </tr>

  </table>
  </center>
}

##############################################################################
package about
##############################################################################
```

```
## The search field that can be found on the Home page (= about page) of the
Information Hub
_aboutqueryform_ [c=sasolinf] {
  <form name=QueryForm method=get action="_gwcgi_">
  <p>
  <input type=hidden name="a" value="q">
  <input type=hidden name="r" value="1">
  <input type=hidden name="hs" value="1">

  <!--
  The next two lines of code are just to reset the selection menus from the
  advanced search page. The basic search module and the advanced search module
  are in fact just one and the same and therefore the options set for an
  advanced search are stored for the basic search as well.
  Therefore, to prevent mixing up of the things, for the basic search the two
  options that can be given in the advanced search are set to 'text search' and
  'OR' search in the two lines below.
  -->
<!-- dirty solution for
basic search: attribute "h", with value "dss" means text search
-->
<input type=hidden name="h" value="dss">

<!-- dirty solution for basic search: attribute "t", with value "1" means OR
search
-->
<input type=hidden name="t" value="1">

<input type=hidden name="e" value="_decodedcompressedoptions_">
  <table cellspacing="0">
  <tr>
    <td>Search now: </td>
    <td><input type="text" name="q" value="" size="50"><input type="submit"
      value="Search"></td>
    <td align="right">  <a href=_httpquery_>Advanced search</a></td>
  </tr>

  </table>
  </p>
  </form>
  }

 ## Contains the content of the about page
 _content_ [c=sasolinf] {
  _aboutqueryform_
  <p>_textabout_</p>
}

_textabout_ [c=sasolinf] {
  <div class="section">
  <h3>Welcome to the SASOL Information Hub</h3>
  <table width=700>
  <td><tr>
  <p>You have just opened the SASOL Information Hub. The Information Hub is a
     digital library system on which you can find all kinds of information in a
     quick and simple way.</p>
  <p>Above here you can type a search query or you can click on 'Advanced
     search' to search more specific. It is also possible to browse through the
     categories and subcategories of the Information Hub. To do this, you have
     to click on the 'Category' button in the navigation bar above.</p>
  <p>If you have information, digital or physic, that is suitable for the
     Information Hub, you can inform the ICT team. They can place the
     information on the SASOL Information Hub. It is of great meaning to extend
     and improve the information on the Information Hub. All information is
     welcome, and you can help to make the Information Hub a success!</p>
  </tr></td>
  </table>
  </div>
}
```

APPENDIX C – Greenstone argument information

short name	long name	multiple char?	multiple value?	default	default status	saved args	current value
a	action	yes	no	p	config	must	"status"
b	query mode	no	no	0	weak	must	"0"
bc1aboutdesc	collector specific	yes	no		weak	mustnot	""
bc1cfgchanged	collector specific	no	no	0	weak	mustnot	"0"
bc1clone	collector specific	no	no	0	weak	mustnot	"0"
bc1clonechanged	collector specific	no	no	0	weak	mustnot	"0"
bc1clonecol	collector specific	yes	no		weak	mustnot	""
bc1contactemail	collector specific	yes	no		weak	mustnot	""
bc1dirname	collector specific	yes	no		weak	must	""
bc1dodelete	collector specific	no	no	0	weak	mustnot	"0"
bc1econf	collector specific	no	no	0	weak	must	"0"
bc1esrce	collector specific	no	no	0	weak	must	"0"
bc1fromsrce	collector specific	no	no	0	weak	mustnot	"0"
bc1fullname	collector specific	yes	no		weak	mustnot	""
bc1infochanged	collector specific	no	no	0	weak	mustnot	"0"
bc1input	collector specific	yes	yes		weak	mustnot	""
bc1inputnum	collector specific	yes	no	3	weak	mustnot	"3"
bc1inputtype	collector specific	yes	yes		weak	mustnot	""
bc1tmp	collector specific	yes	no		weak	must	""
bcp	change	yes	no		weak	mustnot	""

	password submit button						
beu	edit user submit button	yes	no		weak	mustnot	""
bp	set preferences button	yes	no		weak	mustnot	""
c	collection	yes	no		good	must	""
cc	collections to search	yes	yes		weak	must	""
ccp	cross collection page	no	no	0	weak	must	"0"
ccs	cross collection searching	no	no	0	weak	must	"0"
cfgfile	configuration file contents	yes	no		weak	mustnot	""
cl	classification OID	yes	no		none	can	
cm	confirm an action	yes	no		weak	mustnot	""
cmd	config command	yes	no		weak	mustnot	""
cq2	combine queries	yes	no		weak	must	""
ct	collection type	no	no	0	weak	must	"0"
d	document OID	yes	no		none	can	
de	end date	yes	no		weak	must	""
debc	end date bc	no	no	0	weak	must	"0"
dm	date metadata	yes	no		weak	must	""
ds	start date	yes	no		weak	must	""
dsbc	start date bc	no	no	0	weak	must	"0"
e	compressed arguments	yes	no		good	mustnot	"status-0-00---00-0-0--0prompt-10---4------0-1l--1-en-50---20-select---

							00031-001-1-0utfZz-8-00"
el	external link preference	yes	no	prompt	weak	must	"prompt"
er	the compressed args of the refer page	yes	no		weak	mustnot	""
f	frame	no	no	0	weak	mustnot	"0"
fc	include search bar	no	no	1	weak	must	"1"
fqa	form query advanced query	no	no	0	weak	must	"0"
fqc	form query combines	yes	no		weak	must	""
fqf	form query fields	yes	no		weak	must	""
fqk	form query casefolds	yes	no		weak	must	""
fqn	form query num fields	yes	no	4	weak	must	"4"
fqs	form query stems	yes	no		weak	must	""
fqv	form query values	yes	no		weak	must	""
g	granularity	yes	no		weak	must	""
gc	expand contents	no	no	0	weak	can	"0"
gp	go to page	yes	no		none	mustnot	
gt	expand text	no	no	0	weak	can	"0"
h	main index	yes	no		weak	must	""
h2	main index for second query	yes	no		weak	must	""
hd	history display	yes	no	0	weak	must	"0"
hl	highlighting on/off	no	no	1	weak	must	"1"
hp	html page	yes	no		weak	mustnot	""
href	URL of external link	yes	no		none	can	

hs	history save	no	no	0	weak	mustnot	"0"
ifl	i'm feeling lucky	no	no		weak	mustnot	""
il	internal link preference	no	no	l	weak	must	"l"
j	sub collection index	yes	no		weak	must	""
j2	sub collection index for second query	yes	no		weak	must	""
k	casefolding	no	no	1	weak	must	"1"
ky	user time key	yes	no		weak	must	""
l	interface language	yes	no	en	config	must	"en"
m	maximum number of documents	yes	no	50	weak	must	"50"
n	language index	yes	no		weak	must	""
n2	language index for second query	yes	no		weak	must	""
nl	new language	no	no	0	none	mustnot	""
nw	new encoding	yes	no		none	mustnot	
o	hits per page	yes	no	20	weak	must	"20"
p	page	yes	no	home	config	must	"argumentinfo"
pc	phind classifier	yes	no		weak	mustnot	""
pfd	phind first_d	yes	no	0	weak	mustnot	"0"
pfe	phind first_e	yes	no	0	weak	mustnot	"0"
pfl	phind first_l	yes	no	0	weak	mustnot	"0"
pld	phind last_d	yes	no	10	weak	mustnot	"10"
ple	phind last_e	yes	no	10	weak	mustnot	"10"
pll	phind last_l	yes	no	10	weak	mustnot	"10"
ppnum	phind phrase number	yes	no	0	weak	mustnot	"0"
pptext	phind phrase text	yes	no		weak	mustnot	""
pr	protocol	yes	no		none	can	
pw	password	yes	no		weak	mustnot	""
pxml	phind XML	no	no	0	weak	mustnot	"0"

	mode						
q	query string	yes	no		weak	must	""
q2	query string for second query	yes	no		weak	must	""
qb	query box type	no	no	0	weak	must	"0"
qf	query form type	no	no	0	weak	must	"0"
qt	query type	no	no	0	weak	must	"0"
qto	query type options	no	no	3	weak	must	"3"
r	start results from	yes	no	1	weak	must	"1"
rd	include relevant documents	no	no	0	weak	must	"0"
rl	is relative link	no	no	0	none	mustnot	
s	stemming	no	no	0	weak	must	"0"
st	show tips	yes	no	1	weak	must	"1"
t	search type	no	no	1	weak	must	"1"
u	static page	no	no	0	weak	mustnot	"0"
ua	whether a user has been authenticated	yes	no		weak	mustnot	""
uan	whether user authentication is needed	yes	no		weak	mustnot	""
ug	user groups	yes	no		weak	mustnot	""
uma	user management action	yes	no	listusers	weak	mustnot	"listusers"
umc	user management comment	yes	no		weak	mustnot	""
umnpw1	user management new password 1	yes	no		weak	mustnot	""
umnpw2	user management	yes	no		weak	mustnot	""

	new password 2						
umpw	user management password	yes	no		weak	mustnot	""
umug	user management groups	yes	no		weak	mustnot	""
umun	user management user name	yes	no		weak	mustnot	""
umus	user management account status	yes	no		weak	mustnot	""
un	user name	yes	no		weak	must	""
us	user account status	yes	no	invalid	weak	mustnot	"invalid"
v	version	no	no	0	weak	must	"0"
w	encoding	yes	no	utf-8	config	must	"utf-8"
x	detached page	no	no	0	weak	must	"0"
xx	detach all doc pages	no	no	0	weak	must	"0"
z	gsdl uid	yes	no		none	mustnot	

APPENDIX D – Backup procedure

Backups have to be created on a regular basis. During the pilot phase of the Information Hub, it is a little bit difficult to schedule a periodic backup procedure (e.g. once a week) as new information is not yet added regularly and the backup facilities are limited.
Therefore, during the pilot phase of the Information Hub, it makes no sense to describe a strict backup procedure. The maintainers should be responsible to make backups now and then, for example when a lot of new information is added. What is important for now is that it is clear what exactly needs to be saved for backup and restored during backup recovery. These points are described below.
The only place backups can be stored at the moment is the Information Hub client system, directly connected to the server.

Creating a backup
Creating a backup of the contents of the digital library is easy as only one folder has to be copied.

The folder to be copied is called `sasolinf` and can be found under `GREENSTONE_HOME/collect/`

The collection folder contains a lot of data and therefore it is a good idea to compress the folder to a zip archive called `infhub_`*`date`*`.zip` where *`date`* represents the date at which the backup has been made, e.g.: `infhub_08jun2006.zip`. The folder can be copied to the `c:\backup` folder on the client system.

Restoring a backup
For restoring a backup, the collection folder, saved as described above, has to be extracted to the Greenstone collection folder: `GREENSTONE_HOME/collect/`.

Besides the collection folder, the following extra files have to be restored.

File	location
`sasol.dm`	`GREENSTONE_HOME/macros`
`main.cfg`	`GREENSTONE_HOME/etc`
`ConvertToPlug.pm`	`GREENSTONE_HOME/perllib/plugins`
`ImagePlug.pm`	`GREENSTONE_HOME/perllib/plugins`
`UnknownPlug.pm`	`GREENSTONE_HOME/perllib/plugins`

These files can be found inside the backup folder of the client system and/or on the SASOL Information Hub files CD-ROM.

Make sure that, anytime a change has been made to a (configuration) file, a backup of this file is made!!

APPENDIX E – Information Hub conventions

- The folder of a file in the import directory should correspond with the category in the Information Hub.

  So, a file placed in the category ICT, subcategory books should be placed in the import directory (Collection structure of the Librarian Interface) under the directory Books, which is a subdirectory of ICT:

  ICT ——
  | Books

  When a file is assigned to multiple categories, the folder should correspond with the first assigned category (which is the first sf.Category metatag).

- Word en Powerpoint files should be converted to the PDF file format before being added to the library.

- Files that have to be added to the Information Hub should be placed in the c:\toAdd folder of the server system first. After they are added to the Information Hub they should be removed again.

- Files to add should be handed in with a clear title and description. Also the category where the file should be placed should be noted.

- The Information Hub server should be used as a server only. So no other task, like text editing, should be done on this system. Only for maintenance someone should have access to the system.

- Once a week, the contents of the Information Hub should be checked for consistency.

- When the category of a file changes, the location of the file in the Collection structure should be changed as well, so that the changed category corresponds the location of the file in the Collection structure.

- Files with very long filenames may result to errors during build time. The file is not being added to the library as a result.

APPENDIX D – Information Hub User Guide

SASOL Information Hub

-

User Guide

Version 1.0
May 2006

Toosje Geerts
Redmar Atsma

Preface

This manual is written for the employees of SASOL and the students who do their internship for SASOL. The manual explains in a simple and clear way the usage of the Information Hub.
The usage of the Information Hub is very easy and should be self-explanatory. Though, this user manual can be used as a reference or to find more information about a specific component of the Information Hub.

The Information Hub is an initiative of the SASOL foundation and Ex-change, a Dutch NGO that cooperates with the SASOL Foundation.

The end users of the Information Hub can help making the Information Hub project a success. If you got information, either hardcopy or softcopy, that is suitable for the Information Hub, please contact an ICT-student or one of the ICT administrators. All relevant information is welcome and can help to extend and improve the Information Hub.

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1. The use of the Information Hub

The Kitui-district has a shortness of information and knowledge. Nowadays Kitui develops more and more and catches up with the rest of Kenya. For that reason the need of information is getting bigger and bigger. There is information available at ministries, companies and organizations. But in many cases information is not accessible for the people who need the information. Things get done twice, take more time, get done less efficient or are not done at all. The shortness of information directly harms the development of Kitui-district.

Through the years, al lot of information is collected by SASOL and the students. The Information Hub is one point were the information can be stored. The hub makes information easier accessible for people who work at SASOL, so they can extend their knowledge.

2. Information of the Information Hub

The next sections give an overview of what can be found on the Information Hub.

2.1. Categories

Lab technology
How to improve your drinking water quality?
Agriculture
How can I get more yields of my land and my livestock?
Hydrologic
Everything about water, water management and stand storage dams.
Pump technology
How can I get my own affordable pump?
Energy technology
How can I use durable energy sources?
Electricity
Which options do I have when I want to use electricity?
ICT
How can I use the computer more efficient?
Rural Development
How can you improve the circumstances in rural areas?
Administration
Year reports and results of SASOL foundation
Ex-change
Planning-schemes and information about Ex-change for students

Most of these categories have subcategories, and these subcategories have other subcategories.

2.2. Sorts of information

- Reports of Ex-change students
- Reports of Kenyan students
- Reports of other organizations
- Manuals
- E-books
- Books
- Results
- Recommendations
- Maps
- Checklists
- Articles
- Pictures

3. How to start the Information Hub

1. If not already started, start the Information Hub by clicking the SASOL Information Hub icon on the desktop.

Figure 44. SASOL Information Hub icon

2. The homepage of the Information Hub will be seen when successfully started:

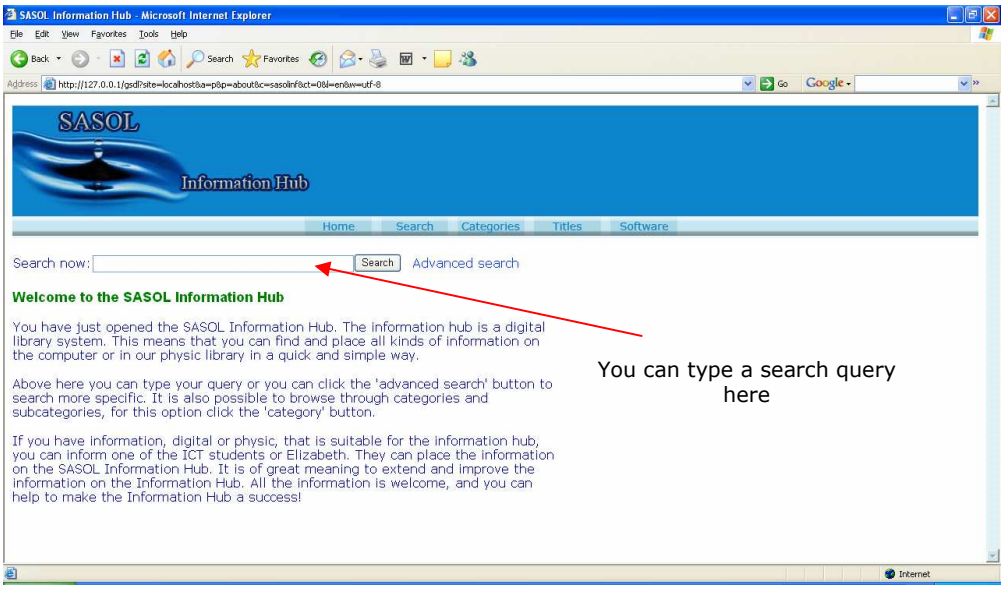

SASOL Information Hub - Microsoft Internet Explorer
SASOL
Information Hub
Home
Search
Categories
Titles
Software
Search now:
Search
Advanced search
Welcome to the SASOL Information Hub
You have just opened the SASOL Information Hub. The information hub is a digital library system. This means that you can find and place all kinds of information on the computer or in our physic library in a quick and simple way.
Above here you can type your query or you can click the 'advanced search' button to search more specific. It is also possible to browse through categories and subcategories, for this option click the 'category' button.
If you have information, digital or physic, that is suitable for the information hub, you can inform one of the ICT students or Elizabeth. They can place the information on the SASOL Information Hub. It is of great meaning to extend and improve the information on the Information Hub. All the information is welcome, and you can help to make the Information Hub a success!
You can type a search query here

Figure 45. Information Hub homepage

Now we can start to search for information.

4. Searching on the Information Hub

There are four different ways of searching for information on the Information Hub.

- The ordinary search query
- The advanced search query
- Searching by category
- Searching by title

4.1. The ordinary search query

This option is used mostly; you only have to fill in the query space on top of the homepage of the Information Hub. The hub will search for matching files. The

results are ordered from relevant to less relevant to the query. The 20 best matching titles will be shown. To view the next 20 match click the arrow button at the end of the page.

4.2. The advanced search query

If you want to search more specific, you can use the advanced search query. To reach the advanced search query you can click the 'Advanced search' button next to the ordinary search query on the homepage. Or you can click the Search button on the navigation bar.

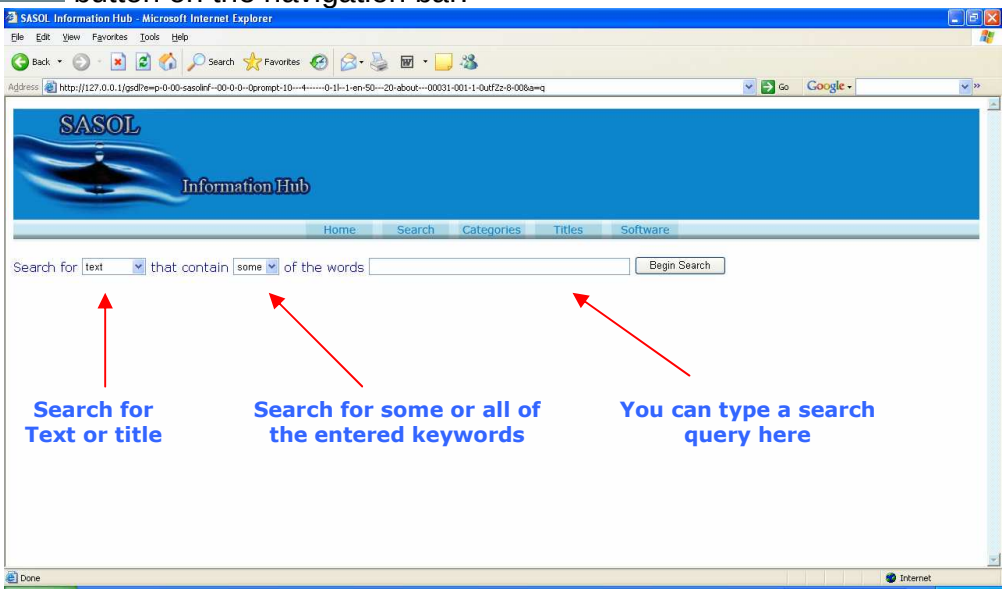


Figure 46. Advanced search page

Some more search options can be specified when using the advanced search option. You can specify to search trough the contents of the documents (text) or to search for a title of a document (titles). And when entering multiple keywords in the search field, you can specify if the search result should contain at least one of the entered keywords (some) or that it should contain all of the keywords (all). These options can be set using the selection boxes in front of the search field.

After entering some keywords to search for in the query space you can click 'Begin Search' to show the results. Again, the first 20 results are shown; if you want to see the next 20 files on the next page click the arrow button at the bottom of the page.

4.3. Searching by category

The third option is searching by category at the Category page, which you can reach by clicking the Categories button on the navigation bar.

A list of all the categories in the Information Hub is shown, as can be seen in Figure 47.

In our example we want to know something about filtering drinking water, so we click the category ‘lab technology’. In the next page, all the subcategories of lab technology are displayed. One of them is ‘filters’, this is exactly the one that we were looking for so we open this subcategory and we will find all sorts of information about filtering drinking water.

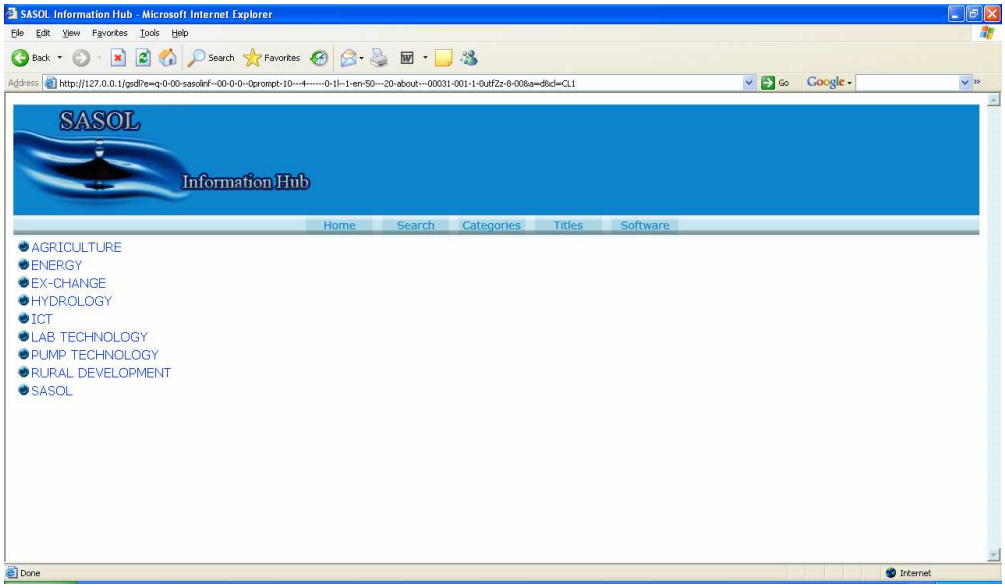


Figure 47. Category page

For example, if we want to know something about filtering drinking water, we have to click on the category ‘LAB TECHNOLOGY’. The contents of this category will be displayed consequently. In our example, we need to choose the subcategory ‘FILTERS’, the contents of this category will be displayed which consists of both subcategories and documents. We can now open one of the documents or further descent in the categories list by clicking a subcategory.

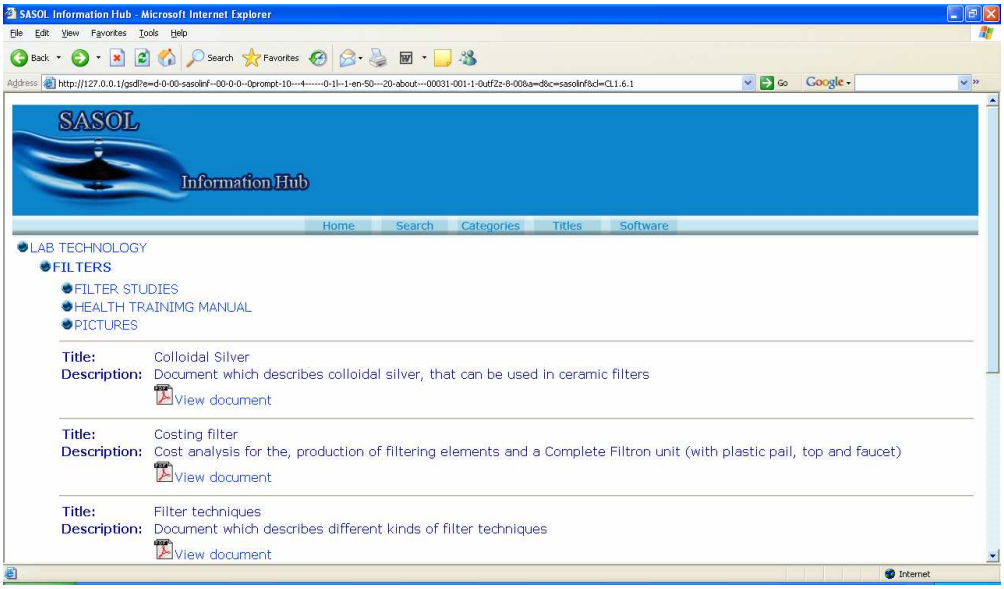


Figure 48. The contents of category LAB TECHNOLOGY, subcategory FILTERS displayed

Note that the active (sub)category is displayed in **bold**. When clicking again on the subcategory 'FILTERS' it will collapse the subcategory again and the contents of the 'LAB TECHNOLOGY' category are displayed again. So in Figure 48, the category 'FILTERS' is currently active, the category contains some subcategories ('FILTER STUDIES',' HEALTH TRAINING MANUAL', 'PICTURES') and documents (Colloidal Silver, Costing filter, etc.).

4.4. Searching by title

It is also possible to search by title, by clicking the Titles button on the navigation bar and click on it. Initially, titles starting with the character 'A' are displayed. To show the titles starting with another character, click the corresponding character from the character list, just below the blue navigation bar.

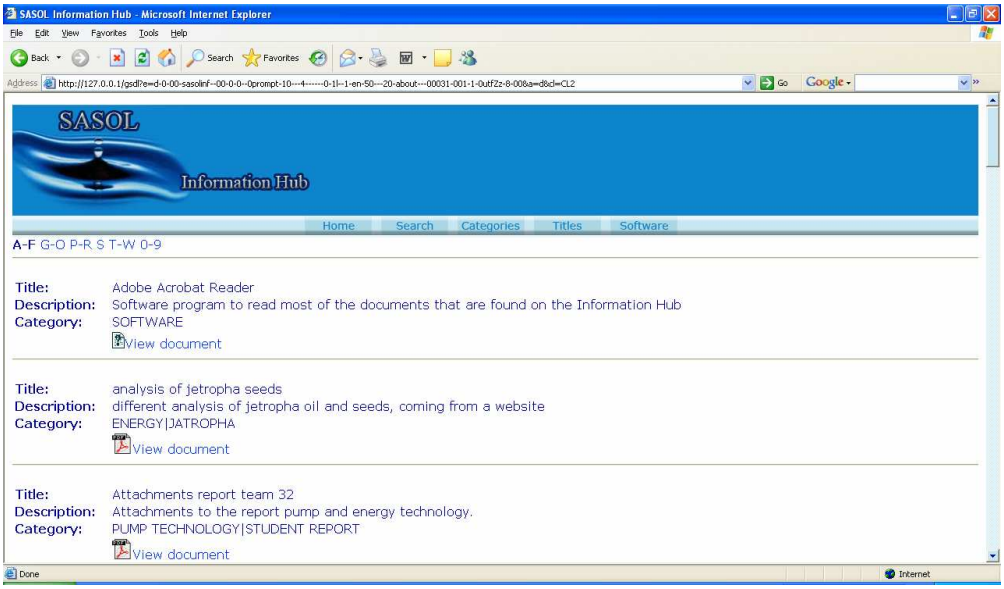

SASOL Information Hub - Microsoft Internet Explorer
SASOL
Information Hub
Home
Search
Categories
Titles
Software
A-F G-O P-R S T-W 0-9
Title: Adobe Acrobat Reader
Description: Software program to read most of the documents that are found on the Information Hub
Category: SOFTWARE
View document
Title: analysis of jetropha seeds
Description: different analysis of jetropha oil and seeds, coming from a website
Category: ENERGY|JATROPHA
View document
Title: Attachments report team 32
Description: Attachments to the report pump and energy technology.
Category: PUMP TECHNOLOGY|STUDENT REPORT
View document

Figure 49. Titles page

5. Opening a file

After you have found a file you'll like to view, you have to open it by clicking on 'View document'.
Most of the documents will open in Acrobat Reader (ask the ICT team for a guide about Acrobat Reader), calculation sheets open in Excel, music and video files open in Windows Media Payer and the pictures are opened in an Internet browser. So as you can see all the files do need different software programs.

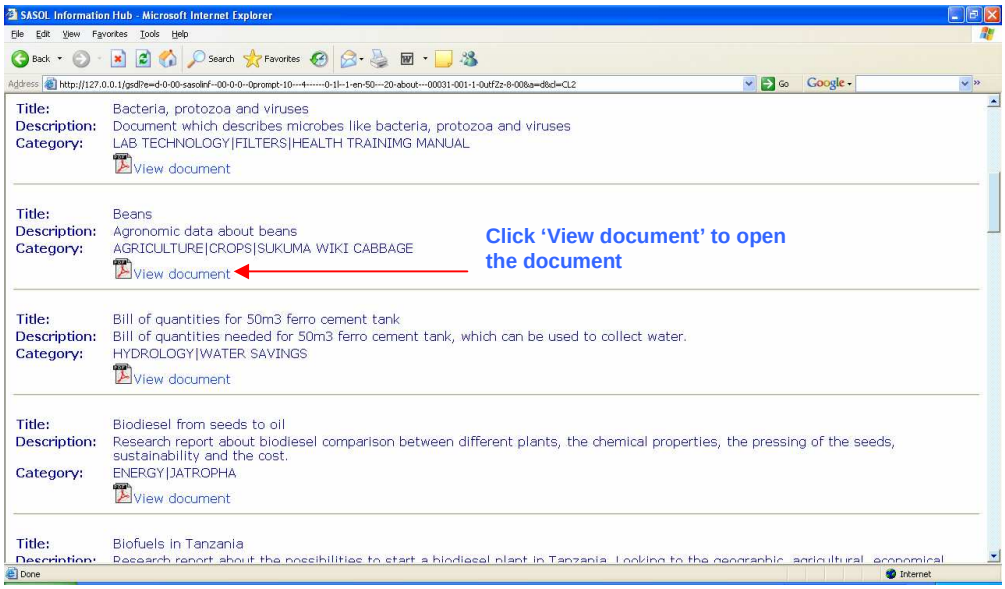

SASOL Information Hub - Microsoft Internet Explorer
Title: Bacteria, protozoa and viruses
Description: Document which describes microbes like bacteria, protozoa and viruses
Category: LAB TECHNOLOGY|FILTERS|HEALTH TRAINIMG MANUAL
View document
Title: Beans
Description: Agronomic data about beans
Category: AGRICULTURE|CROPS|SUKUMA WIKI CABBAGE
View document
Click 'View document' to open the document
Title: Bill of quantities for 50m3 ferro cement tank
Description: Bill of quantities needed for 50m3 ferro cement tank, which can be used to collect water.
Category: HYDROLOGY|WATER SAVINGS
View document
Title: Biodiesel from seeds to oil
Description: Research report about biodiesel comparison between different plants, the chemical properties, the pressing of the seeds, sustainability and the cost.
Category: ENERGY|JATROPHA
View document
Title: Biofuels in Tanzania

Figure 50. opening a document

If you open an Excel document, a window like Figure 51 will appear. Click 'Open' if you want to view the file. If you want to store the file on an external storage device click 'Save'. For more saving instructions see chapter 7 Saving a file from the Information Hub.

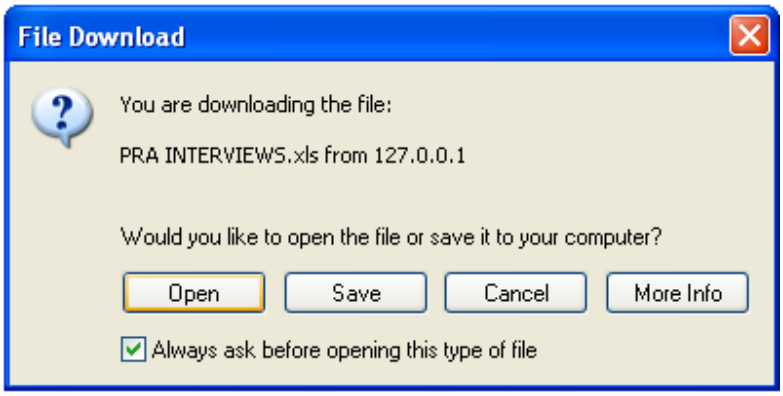

File Download
You are downloading the file:
PRA INTERVIEWS.xls from 127.0.0.1
Would you like to open the file or save it to your computer?
Open
Save
Cancel
More Info
Always ask before opening this type of file

Figure 51. Opening a Excel document

If you want to close the document and continue searching on the Information Hub, you can click the cross in the upper right corner of the screen.

6. Software

If you click the

button on navigation bar, you will go to a page were you can download software applications and tools. E.g. if you don't have Adobe Acrobat reader on installed on your computer, you can download the software from here and install it on your computer. Ask someone of the ICT team if you're not sure how to install software on your computer.

7. Saving a file from the Information Hub

Sometimes it is useful to take a file from the Information Hub and store it somewhere else, or to get a hardcopy of it. It is possible to save a file on a floppy disk or memory stick. The Information Hub contains four different files types: documents, Excel sheets, pictures and movies, they all need their own saving instructions.

7.1. Documents

1. Go to the menu bar and click the floppy icon, it is the most left icon on the page; it is also called 'Save a Copy…' In Figure 52 you can see the floppy icon in the red circle.

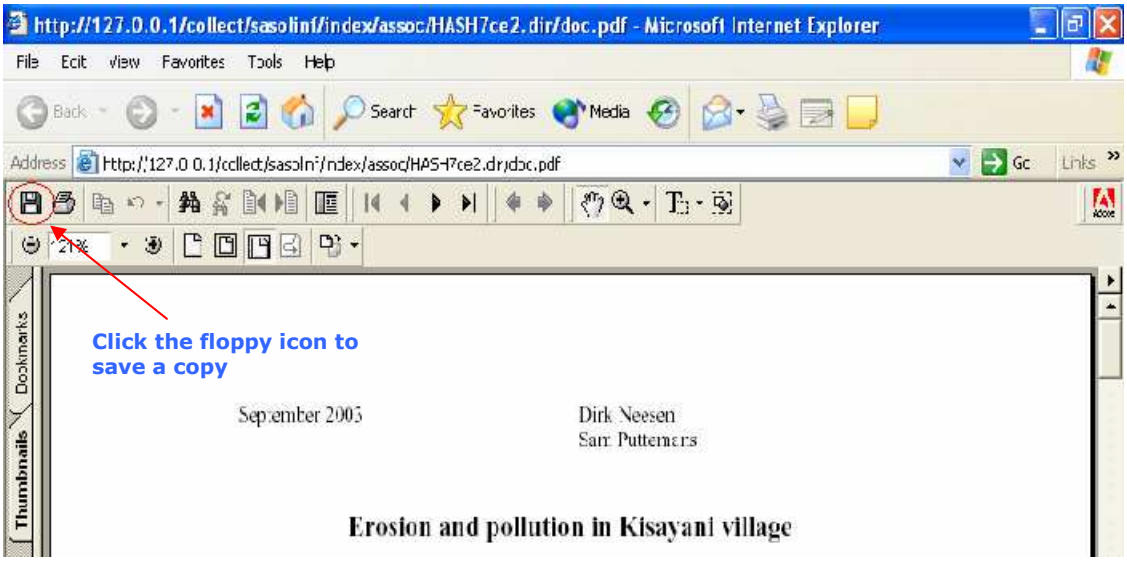


Figure 52, Save a Document

2. If you have clicked the floppy icon, a window like in Figure 53 appears.

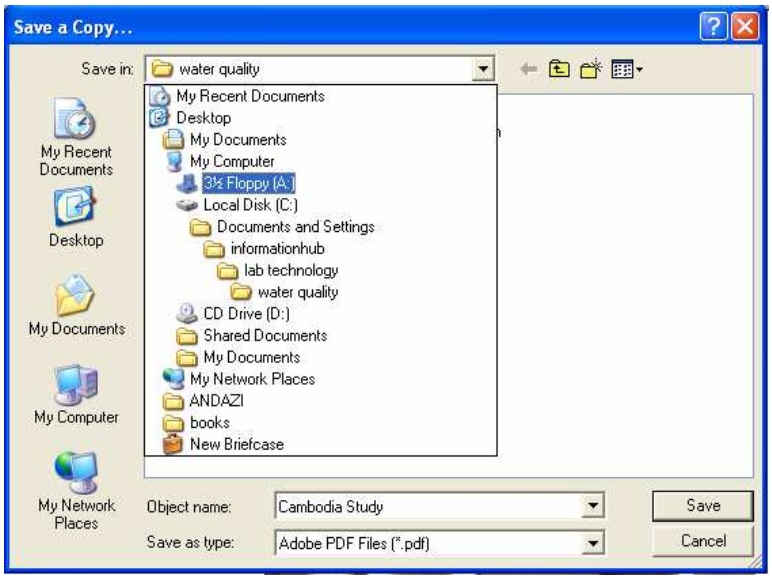


Figure 53, Save a Copy...

3. Click on the field next to 'save in', and select the place were you want to save your file, e.g. 3 ½ Floppy (A:).

4. Sometimes it is necessary to change the name of the file you want to save, if you want to change the name click the field next to ‘Object name’. Now you are able to change the name of the file.

5. After selecting the location were you want to save the document and optionally changed the name, click the ‘Save’ button. Now you have saved the document.

If you want a hardcopy of a document you can go to one of the copy shops in town. There they can print a copy for you from your floppy disk or memory stick.

7.2. Excel sheets

1. Saving an Excel sheet is almost similar as saving an Acrobat Reader document. First you click ‘file’ in the menu bar, a menu appears, click ‘Save As…’ See Figure 54.

Figure 54, saving a excel sheet

2. You get a Save window, similar to Figure 53.

3. Select the storage device you want to use e.g. floppy disk or memory stick, in the field next to ‘Save in’.

4. If you want to give your file another name click the field next ‘Object name’, you can change the name of the file now.

5. After you have selected your storage device and changed the name of the file, click the ‘Save’ button. Now your sheet is saved on the storage device you want.

7.3. Pictures

1. If you want to save a picture on your memory stick or floppy disk you first open the file. A new window opens to display the picture. Go with your pointer to the picture and click the right button of your mouse. A menu appears, click ‘Save as’. See Figure 55 for the menu.

2. Again a window similar to Figure 53 will appear, select the storage device you want to use, e.g. floppy disk or memory stick, in the field next to ‘Save in’.

3. If you want to change the name of the picture, click the field next to ‘Object name’. Now you are able to change the name.

4. If you have selected your storage device and changed the name of the file, click the ‘Save’ button.

Figure 55, Save Picture As..,

7.4. Movies and Audio

1. If you open a file that contains a movie or audio, the Information Hub automatically opens the Windows Media Player. When you want to save a movie or audio file you have to hold in mind that movie and audio files are big, and probably won’t fit on a floppy disk.

2. If you have a storage device that is big enough, like a memory stick you can save the file by clicking ‘file’ in the menu bar.

3. A menu will appear, click ‘Save as…’

4. Again a window similar to Figure 53 will appear, click the field next to ‘Save in’ and select the storage device, e.g. your memory stick.

5. After you have selected the storage device, you can change the name of the file by clicking the field next to ‘Object name’; after you have clicked you can change the name of the file.

6. After changing the name, click the ‘Save’ button. The movie or audio file is saved now.

APPENDIX E – Network Cost Overview

Nairobi offers some good shops where high-quality network devices can be found. Prices are, compared to Europe, rather high.

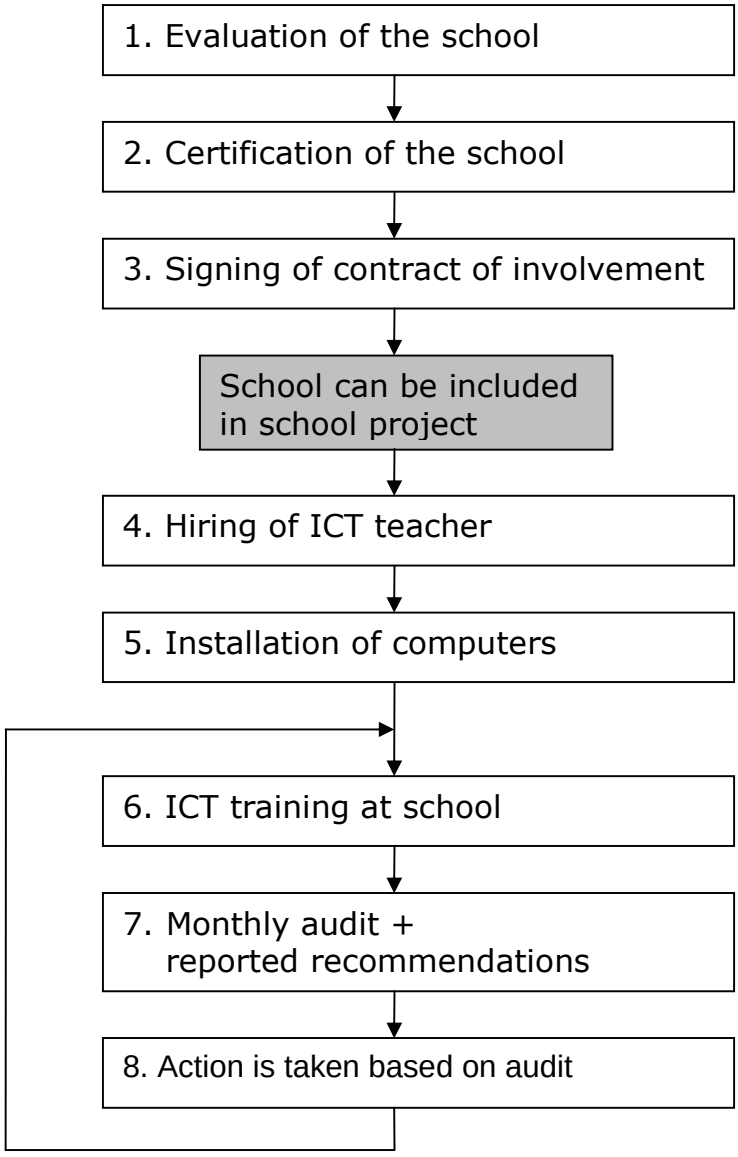
The scheme below gives an overview of the average cost of network devices in Nairobi, both in Kenyan Shilling (KSH) and in Euro. At the time of writing, 1 euro is worth around 90 Kenyan Shillings.

component	Price in KSH	Price in Euro
UTP cable cat. 5.0	15/m	0.17
Connector UTP cat 5.0	15/piece	0.17
RJ-45 crimping tool	1500	16,-
Switch 8-port	4000	45,-
Switch 16-port	6500	70,-
NIC	550	6,-

At least one 16-port switch is required in the ICT room of SASOL. An extra 8-port switch is required in the second SASOL office building. Network Interface Cards (NICs) are not necessary to buy at the moment as most of the systems are already equipped with one and also some separate NICs can be found in the office. The price of cables/connectors is, compared to the rest of the cost, extremely low. The two switches are the main investments; together it can be expected to cost more than 10.000 (110 euros), which is high.

APPENDIX F – New School Structure

The ICT school project will involve the following steps:


1. Evaluation of the school
2. Certification of the school
3. Signing of contract of involvement
School can be included in school project
4. Hiring of ICT teacher
5. Installation of computers
6. ICT training at school
7. Monthly audit + reported recommendations
8. Action is taken based on audit

1. The first step when a new school desires to participate in the school project is to evaluate the school. During the evaluation phase a research will be done to see if the school can be a potential candidate for the school project. In this phase it is not necessary that the school already accomplishes all of the conditions as stated in the school projects' contract; if it is likely

that the school can fulfill the conditions in the near future the school can be hold as a potential candidate, till the conditions are met.

2. As soon as the school meets the contract's conditions the school can be certificated as an 'ICT school project candidate'

3. After signing the contact the candidate accept the conditions stated in the contract. The candidate is now officially included in the school project as a participant.

4. Accordingly to the contract the school should now hire an ICT teacher, if not already done, or if there is no teacher already available at the school.
   If there is a teacher available at the school with basic ICT knowledge this person can be trained as an ICT-teacher by Sasol, under the condition that this person can be scheduled at the school as a full-time ICT teacher.

5. When the ICT teacher is present at the school a start can be made with the installation of the computers.

6. Now that the school is equipped with a decent computer room the school's students can be trained in ICT lessons.

7. Every month an audit will take place. During this monthly audit a checklist has to be filled to check if the school fulfills the requirements of the Contract of involvement. The checklist has to be stored in the Information Center of Sasol, both in hard-copy format and digitally on the Information Hub.

8. Depending on the outcomes of the monthly audit appropriate actions will be taken to improve or to maintain the ICT situation at the specific school.

Step 6 till 8 is a continuing process.

Course content

Secondary schools should be taught according KNEC (Kenya National Examination Council). KNEC is the national examining body which is responsible for setting national examinations for primary and secondary schools and tertiary colleges. ICT examinations are available for secondary schools and colleges, but not for primary and polytechnic schools. Therefore, these schools should be taught using

the course material of SASOL-Exchange. The course material will be created by the students in the project in collaboration with the ICT teachers of the participating schools.

SASOL-EXCHANGE,
KITUI SCHOOLS ICT PROJECT,
P.O. BOX 85,
KITUI.

SASOL-Ex-change School ICT Project yearly audit

1. Is there an ICT-teacher available at the school?
   O Yes
   O No

   Comments:

   _____

   _____

   _____

2. Is the school teaching ICT lessons to their students as part of their regular course program?
   O Yes
   O No

   Comments:

   _____

   _____

   _____

3. For Secondary schools only: is the school being taught according KNEC?
   O Yes
   O No

   Comments:

   _____

   _____

   _____

4. Is the school giving ICT assessments to their students on a regular basis?
   O Yes
   O No

   Comments:

   _____

   _____

   _____

5. What is the level of the student's ICT knowledge currently?

Basics of the computer O Poor O Average O Good O Very Good	Windows O Poor O Average O Good O Very Good	Word O Poor O Average O Good O Very Good
Excel O Poor O Average O Good O Very Good	Powerpoint O Poor O Average O Good O Very Good	Access O Poor O Average O Good O Very Good
Basics of Programming O Poor O Average O Good O Very Good		

6. What is the condition of the computer systems
   O Poor
   O Average
   O Good
   O Very Good

7. Are there systems or components which have to be replaced?
   O Yes,
   Kind of (Tower/Monitor/Component etc.):

_____

Serial Number (if available):

_____

O No

8. Is a computer extension necessary at the school?
   O Yes, amount of extra computer systems needed:
   _____
   O No

9. Feedback of ICT teacher. Difficulties, improvements or anything else the ICT teachers wants to inform about the school project can be noted here:

_____

_____

_____

_____

_____

_____

Every audit report has to be placed on the Information Hub, digitgally!

SASOL-EXCHANGE,
KITUI SCHOOLS ICT PROJECT,
P.O. BOX 85,
KITUI.

SASOL-Ex-change School ICT Project Contract of Involvement

1. Any school that wishes to participate in the ICT project **MUST** fulfill the following conditions:
   - A fulltime ICT teacher should be hired
   - Other teachers should be given substantial ICT training
     Option: If there is a teacher available at the school with enough time he/she can also be the ICT contact person and teacher
   - A well equipped computer room should be available
   - There should be a stable power supply for the computer room
   - The computer room should be secure
   - The school should accept a monthly audit of the project

2. If the school does not accept the contract or does not fulfill the requirements of the contract SASOL-Ex-change will **NOT** include the school in the project.

3. In a school where the project is ongoing the recommendations of the monthly audit will have to be acted upon as immediately as possible.

4. SASOL-Ex-change reserves the right to withdraw from any school which fails to implement the conditions of this contact or repeatedly fails to act on the recommendations of the monthly audit.

The management of this school has carefully read and understood this contact and wishes to be included in the project. We as a school will be bound by the conditions set out in this contact and will uphold them at all times.

SCHOOL REPRESENTATIVE

NAME:	
DESIGNATION:	
SIGNATURE:	
DATE:	

SASOL EXCHANGE IT PROJECT REPRESENTATIVE

NAME:	
DESIGNATION:	
SIGNATURE:	
DATE:	